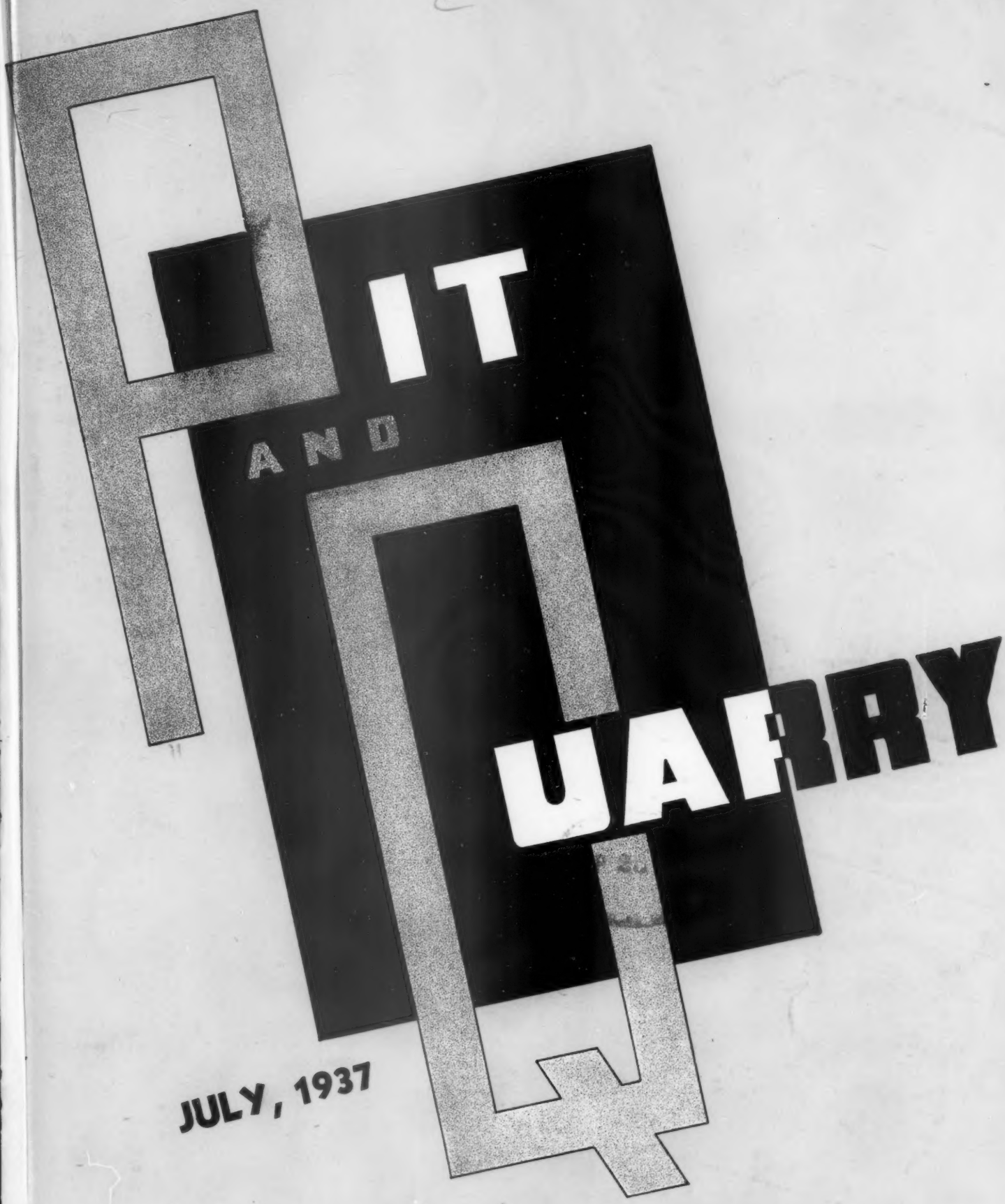

JULY, 1937

Closed-Circuit Grinding . . . Cement-Plant Improvements by Marquette, Diamond, Cumberland, Universal Atlas . . . Report of A. S. T. M. Meeting . . . Labor Relations Symposium

TN1
.P65

BIG RESULTS

with a LITTLE PUMP

Lincoln Sand Company
Producers of Quality Molding Sand
Big Creek, West Virginia
April 16, 1935.

Mr. Cecil A. Lockhart,
The Allen-Sherman-Hoff Company,
223 South 15th Street,
Philadelphia, Pa.

Dear Mr. Lockhart:

I am pleased to say that your Hydroseal pump performed even more efficiently than we had expected. Its operation on a pump main by mechanical engineers, and by mechanics employed by the manufacturers, was entirely satisfactory.

Your statements about the Hydroseal pump passing actual tests.

Concrete except that the pump is to drive last year, but

months ago, since I started to operate your pump about six any way and, in addition, the highest tensile steel in reserve or satisfaction of any kind. In an estimate certainly feel comfortable in recommending a pump equipped with one item, every sand and gravel plant in the country should

Yours very truly,

About 80 tons per hour are handled by this 6" Hydroseal Dredge Pump, for the 100 ton sand bin on the shore, 500 feet away (elevation 60 feet) is filled in about 1½ hours, yet 10% to 20% of the material pumped must be screened out as oversize . . . A 75 H. P. Diesel was originally thought necessary to drive the pump, but it was later found that the surplus power, made available by the Hydroseal Principle, was adequate for the following:

(1) To generate electricity to drive the cutter head at the pump suction and to supply various electric lights around the plant.

(2) To furnish power for the pump which supplies water to the agitating nozzles at the pump suction.

Address nearest office listed at right for a copy of our catalog No. 836 or any other information.

HYDROSEAL Dredge PUMPS

ASH

HYDROSEAL AND MAXIMI
DESIGNS ARE COVERED B
PATENTS AND APPLICATION
IN THE MAJOR MINING CENTER
OF THE WORLD AND CAN B
PURCHASED ONLY THROUGH
THE FOL'OWING COMPANIE

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The Denver Machinery Co.
206-8 Commissioner Street
Johannesburg, Union of S.A

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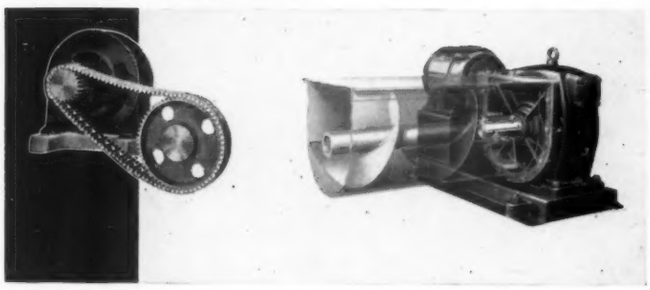

THE SYMBOL OF QUALITY

LINK-BELT

WHAT "BUILT *by* LINK-BELT" MEANS TO YOU

● It is an assurance of reliable performance, long life and maximum efficiency in all elevating, conveying and power transmitting services through your plant. The Link-Belt standard of quality, plus superb service, is yours for the asking. Large stocks are carried at all Link-Belt plants and warehouses and by many distributors.

LINK-BELT COMPANY

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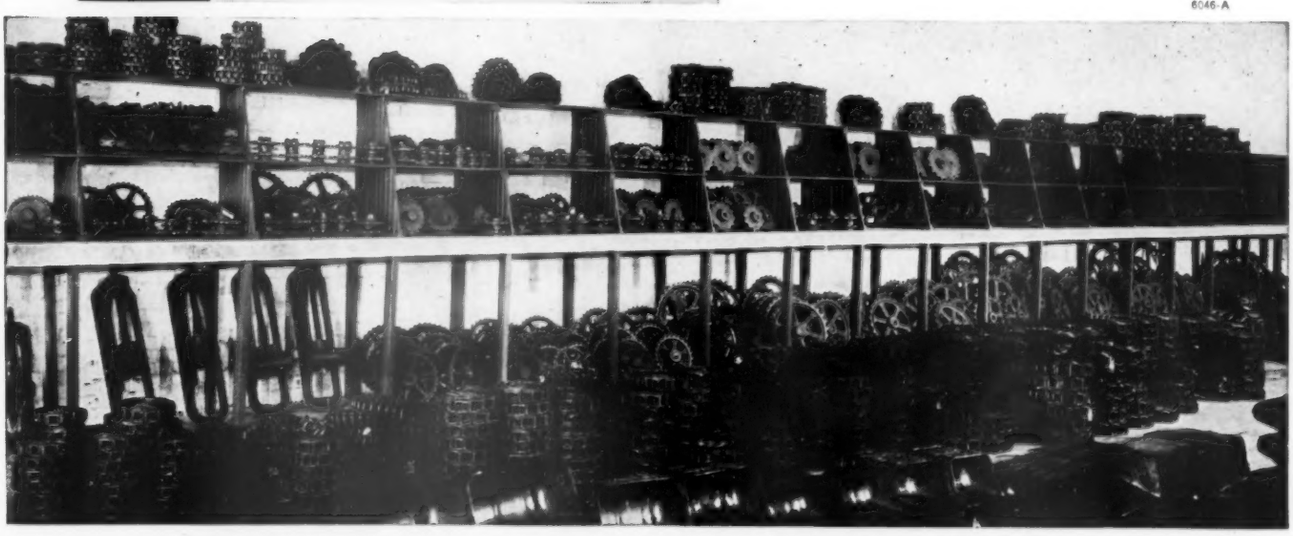


PIT AND QUARRY, July, 1937. Vol. 30, No. 1. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price $1 for 1 year in the U. S. and possessions, Canada and Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter November 28, 1932, at the Post-Office at Chicago, Ill., under the Act of March 3, 1897. Additional entry at Milwaukee, Wis.

QUARRY CUTS AIR HOSE COST *75 per cent!*

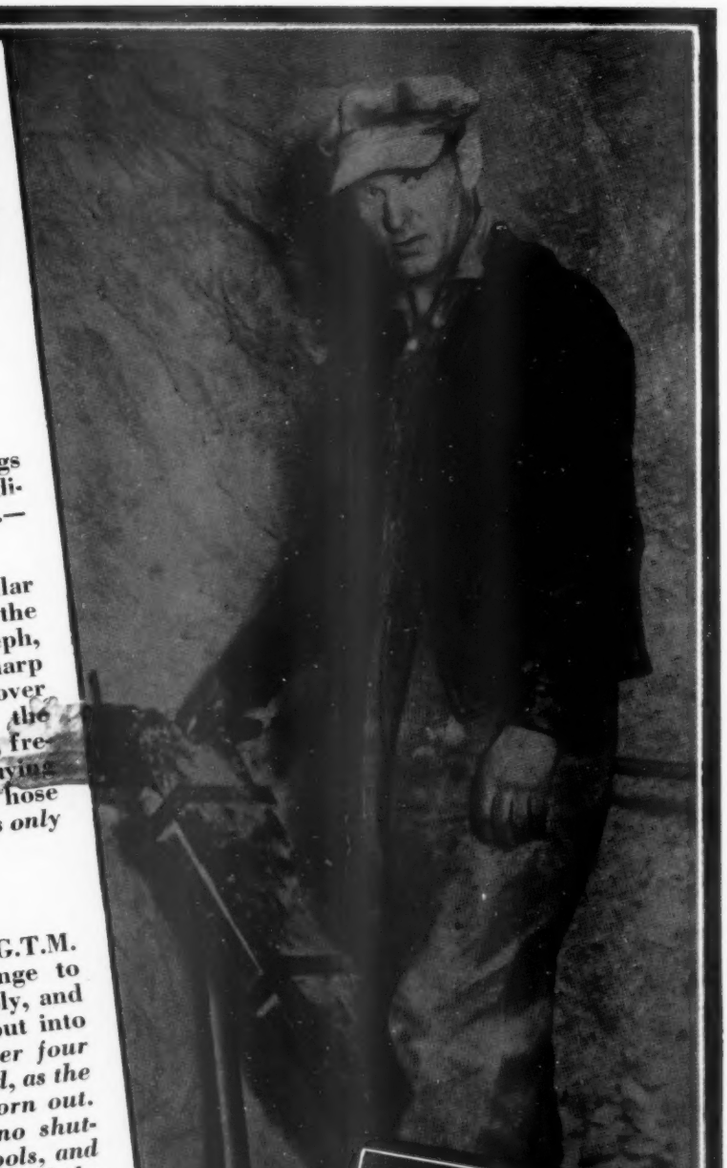
HERE is a typical example of the savings that can be made by having air hose individually specified to the job by the G.T.M.—Goodyear Technical Man.

Air hose troubles used to be a pretty regular thing in the underground operations of the Heumader Quarries Company, St. Joseph, Missouri. Constant dragging over the sharp rocks caused severe abrasion and rapid cover wear. Lubricating oil passing through the lines caused the tube to swell and flake, frequently clogging the hammers and delaying the work. Several different makes of hose were tried, but *the maximum service was only one year!*

G.T.M. Says "Style M"

Noting these conditions carefully, the G.T.M. recommended that the quarry change to Goodyear Style M Air Drill Hose, 4-ply, and in May 1933, several lengths were put into service on the hammers. *Today, over four years later, this hose is still in use and, as the photograph shows, it is far from worn out. In all this time there have been no shutdowns and delays due to clogged tools, and the saving in replacements has reduced the company's air hose bill 75%.*

Couldn't you use savings like that? To give you similar economy on any type of job Goodyear makes five different types of air hose to fit every service requirement. The G.T.M. will be glad to recommend the proper type for your operation if you will write him, care of Goodyear, Akron, Ohio, or Los Angeles, California—or the nearest Goodyear Mechanical Rubber Goods Distributor.



G.T.M.-Specified
GOODYEAR STYLE M AIR DRILL HOSE
for heavy service in mines and quarries

1 Super-tough rubber cover that offers greater resistance to cutting, peeling and abrasion than wire-wound hose.

2 Heavy duck carcass that holds high pressures and absorbs "tow-rope" strains.

3 Thick, slow-aging, non-swelling, oil-resisting, air-tight rubber tube.

BELTS
MOLDED GOODS
HOSE
PACKING
Made by the makers of Goodyear Tires

THE GREATEST NAME IN RUBBER
GOODYEAR

HAVE YOU CONSIDERED A *Page Walking Dragline* FOR YOUR JOB?

High Yardage Draglines For All Classes of Excavation
Diesel Powered—3 Cubic Yard Capacity and Larger

Page Walkers in the series "600" are completely modern, rugged, dragline machines with fast load, hoist, and swing speeds for greater yardage 24 hours per day, month after month.

Also—because of the large circular base and the positive crank action walking mechanism, Page Draglines work on softer ground, move immediately in any direction.

If your job requires more yardage,—lower operating cost,—longer reach—and complete independence of weather conditions, investigate thoroughly the Page Walkers Series "600". Use the Convenient coupon.

Page Engineering Co.

Clearing Post Office " " Chicago, Ill.

PAGE AUTOMATIC DRAGLINE BUCKETS
PAGE WALKING DRAGLINE MACHINES

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Please send information on a Page "600" Walker. Size _____

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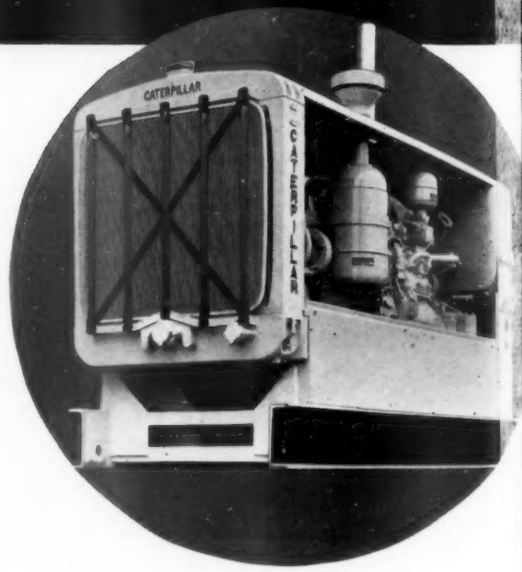
"BEST ENGINE I EVER HAD"

FOR one who has used many engines, John Guerra is a man of few words. But they pack a world of meaning! "Best engine I ever had," sums up the low operating cost of his 125-hp. "Caterpillar" Diesel Engine and the way it stands up under the heavy demands of his rock-crushing plant at River Drive and Strodman Road, St. Louis, Mo.

With an output of 350 tons per 10-hour day, his fuel-and-lubrication cost is only thirty cents an hour — 1 1/6c a ton, or less than one-fourth the usual cost of other types of power. In 20 months of service, not a cent has been spent for repairs.

And there are *thousands* of other actual instances, covering most every industry, which offer similar proof of the extraordinary economy of Diesel power as perfected by "Caterpillar." Ask the nearest dealer for details. Or, write us direct.



SEVEN ENGINE SIZES—44 TO 160 HP.

CATERPILLAR DIESEL ENGINES

REG. U.S. PAT. OFF.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS . . . WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES

*TIMKEN Bits
meet every need

The TIMKEN Rock Bit range includes types and sizes for every drilling condition that may be encountered.

TIMKEN Bits are made in three different types—cross, rose and chisel—available with either center or side hole in all required gauges.

There is only *one quality* however, and that is the highest that can be produced. TIMKEN means as much in rock bits in this respect as it does in tapered roller bearings.

To get this superior quality and the advantages that go with it—including streamlined design, faster drilling and more footage per bit—you pay a little more for TIMKEN Bits—but you will find them cheaper in the long run.

If you are not using TIMKEN Bits you are losing a modern opportunity to reduce your drilling costs. Why not give them a tryout now? We are ready to conduct a demonstration whenever you say the word.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

* TRADE-MARK REG. U. S. PAT. OFF.

TIMKEN
ROCK BITS

Gibsonburg Lime Products Company . . .

. . . will power their main crusher with a

Superior DIESEL

Another splendid example of the versatility of Superior Diesel power in meeting the demand for lower cost power in quarries and rock crushing plants.

A 260 H. P. Superior Diesel will take over the hardest job of driving the main crusher, and in addition, a 100 K. W. generator will be belted from the engine to supply the power for miscellaneous motors. Other irregular loads will remain on the outside power line.

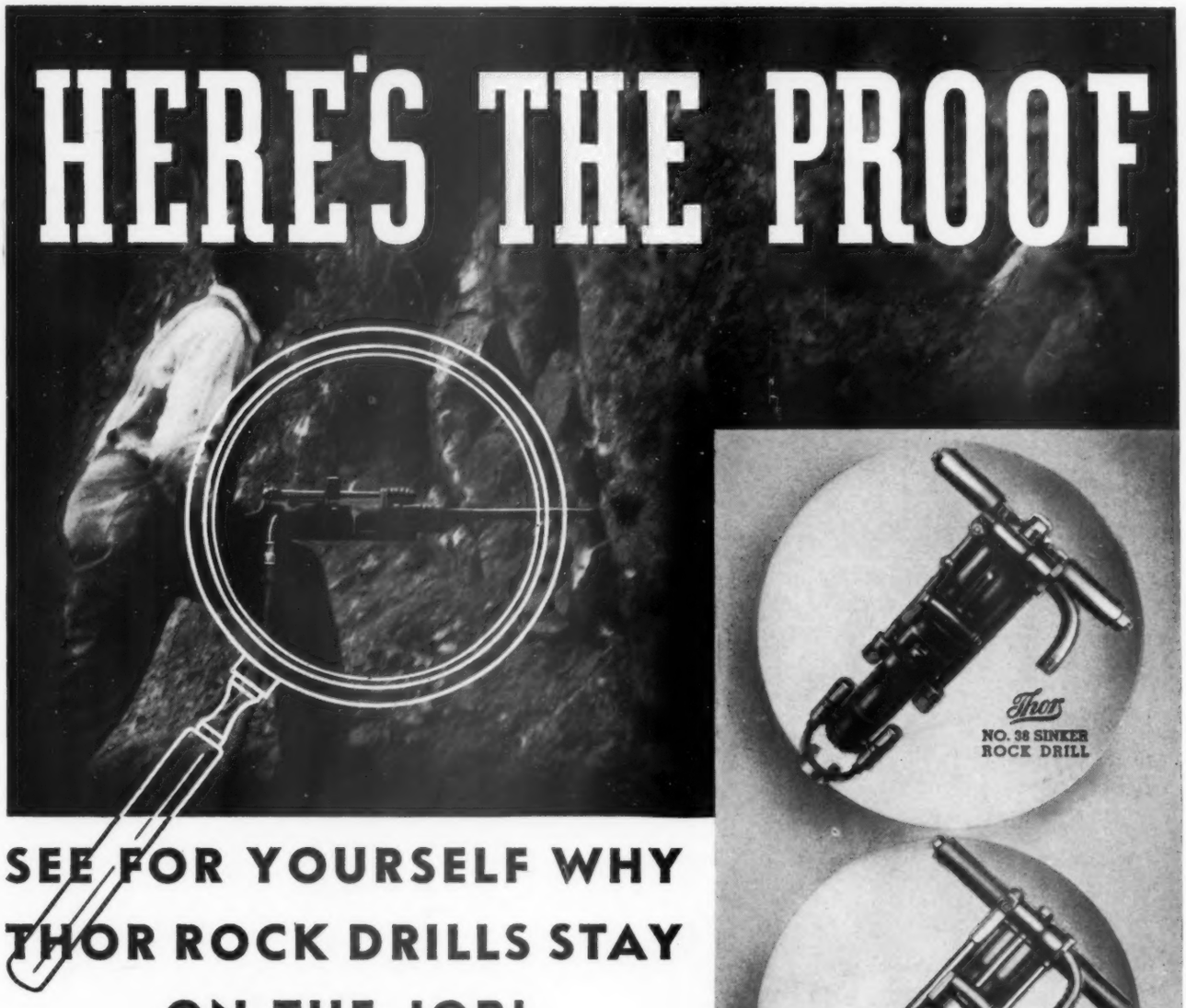
By this method, large annual savings are assured and demand charges greatly lowered, with minimum investment in new equipment. It suggests a money-saving opportunity that every plant in the industry should investigate at once. Let us work out a similar application for you. Our engineering service and our products are designed to save you money—and the engineering service is free!

THE NATIONAL SUPPLY COMPANY
OF DELAWARE
SUPERIOR ENGINE DIVISION, SPRINGFIELD, OHIO
LOS ANGELES, CALIFORNIA PHILADELPHIA, PA.

Superior DIESELS

HEAVY DUTY MODELS: 50 to 810 H.P., 250 to 720 R.P.M. • HIGH SPEED MODELS: 15 to 150 H.P., 900 to 1800 R.P.M.

HERE'S THE PROOF



SEE FOR YOURSELF WHY THOR ROCK DRILLS STAY ON THE JOB!

• When you buy Rock Drills you want PROOF of performance . . . and Thor is ready to give it to you. Take any of the machines in the extensive Thor line and make your own performance and economy tests with them under your own operating conditions. Check their power, speed, efficiency and dependability. Then you will see for yourself why Thor Rock Drills *"Stay on the Job."*

Thor representation is wide-spread, with branches, dealers and service stations in every principal city.

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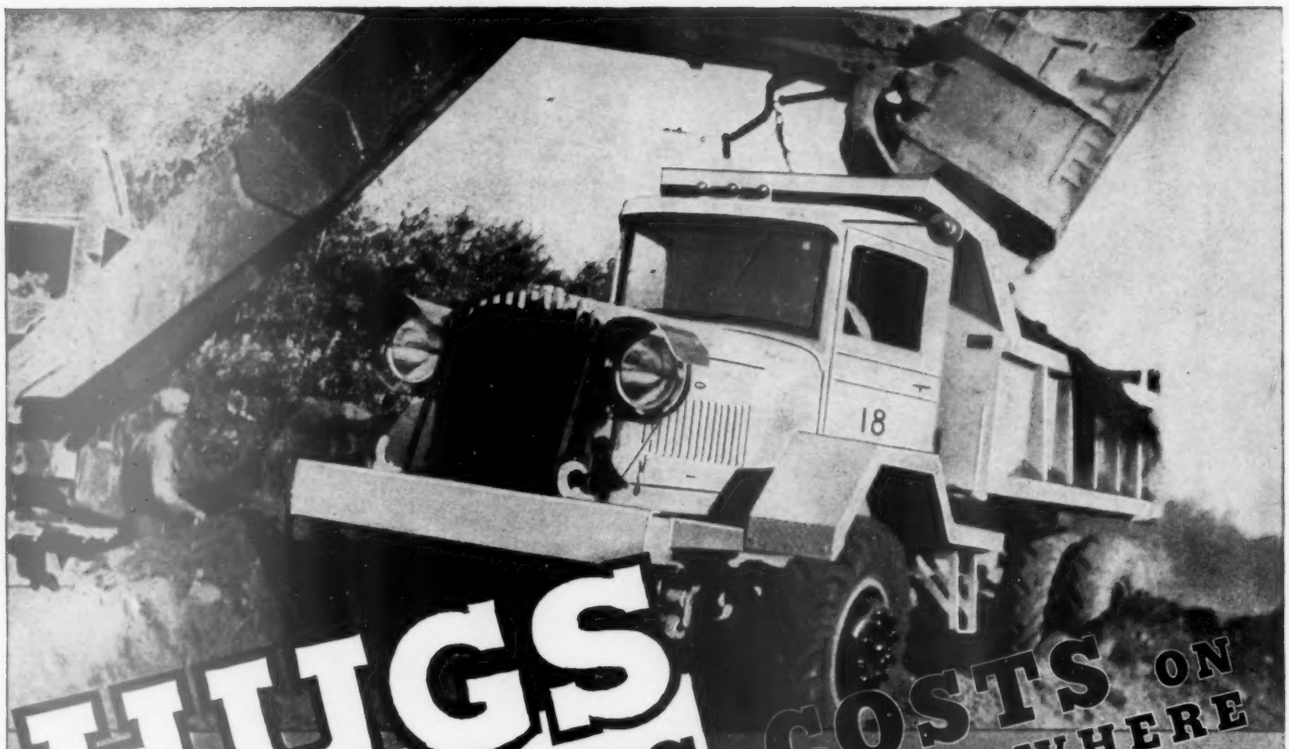
COCHISE ROCK DRILL MFG. CO. Division 6200 E. Slauson Avenue, Los Angeles, California



HUGS ARE CUTTING COSTS ON THE TOUGHEST JOBS EVERYWHERE

BECAUSE of their superior design and construction, Hugs are cutting costs on the toughest hauling jobs throughout the construction industry. For Hugs are especially built for tough going—built to your own requirements to do a hard job faster and more economically than any truck on the market.

Hug engineering includes such features as the Hug front axle rocker action with new universal spring shackle; rugged arc welded "I" beam frame; set back wheel design with resulting short turning radius and equalized load distribution; the Hug back-up brake that makes the long back-up easy; double reduction rear axle; wide range of transmission speeds; heavy duty spring design and a range of arc welded bodies to meet any hauling requirement.

Hugs are available for every type of dump truck transportation service—for batch hauling, quarry operations, for dirt and rock excavation—and with Hugs you'll get faster hauling of bigger pay loads at less cost.

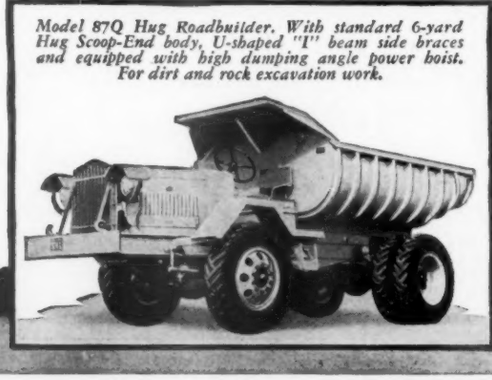
Write to Hug today! Let Hug engineers show you how Hug transportation units can meet your toughest hauling problems and cut your hauling costs.

HUG

THE HUG COMPANY
501 Cypress Street
HIGHLAND, ILLINOIS

Model 99 Hug Quarry Special. Designed for heavy duty quarry service, with 10-yard Hug Quarry body—36,000 lbs. pay load capacity.

Model 23D Hug Roadbuilder. 3 to 3½ yard capacity especially designed for multiple batch hauling.



Model 87Q Hug Roadbuilder. With standard 6-yard Hug Scoop-End body, U-shaped "I" beam side braces and equipped with high dumping angle power hoist. For dirt and rock excavation work.

LORAIN 87 TOPS OFF BUSY DAY WITH NIGHTLY "STRIP ACT"

DURING the day this Lorain-87 shovel of the Union Limestone Company loads out as much as 340 cars of rock in 7 hours' working time. But that is only half its job. When the evening whistle blows, this shovel moves on up to the top of the quarry where it spends the night in stripping service.

It is on tough, unusual jobs such as this that Lorains show up to best advantage. Built to the Center Drive design, these machines not only have the power and stamina to produce big tonnage consistently but offer the necessary mobility required for all-purpose quarry service.

That's why Lorains of 2 to ⅜ cu. yd. are preferred by those operators who want to keep material handling costs at rock bottom.

THE THEW SHOVEL COMPANY
LORAIN, OHIO

THEW CENTER DRIVE REG. U.S. PAT. OFF.

LORAINS
MOVE MORE MATERIAL, FASTER AT LOWER COST

CU. 3/8 to 2 YD.

IS FATHER TIME HARD ON YOUR SCREENS?

DOES your screening fail in the "prime of life"... or does it go on to a ripe old age?

The life span of wire screening is based solely on the inherent toughness and stamina of the wire itself.

Wire making for the tough jobs... to meet exceptionally severe strength, vibration and abrasion requirements . . . has been Roebling's task for over 90 years.

If screen life extension is your problem, we offer you the benefit of this wire making knowledge, backed by a half century's experience in wire fabrication.

Roebling makes Wire Screening in a range of types and metals for all cleaning, grading and sizing service.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N.J. *Branches in Principal Cities*

ROEBLING *Wire Screen*

TRADE JERSEY MARK

90 YEARS OF WIRE MAKING SPELLS THE DIFFERENCE

DESIGNED TO CUT OPERATING COSTS

follow the trend

LIMA

Photograph shows one of two LIMA shovels owned by Martin Wunderlich Co., Jefferson City, Mo., working near Idaho Springs, Colorado.

A definite and important part has been played by LIMA in the advancement of power excavator design. LIMA was first to introduce anti-friction bearings at every vital bearing point.

Later, efficient helical cut gears replaced the old-fashioned spur gears.

To these two important features were supplemented spline shafts, square lever shafts, synchro-power clutches and many other important advantages, all of which, when combined, result in a quiet, economical and smooth running excavator that lowers operating costs and increases production on any construction or material handling job requiring shovels, draglines or cranes. • • •

LIMA LOCOMOTIVE WORKS, Incorporated, Lima, Ohio, U. S. A.
SHOVEL AND CRANE DIVISION

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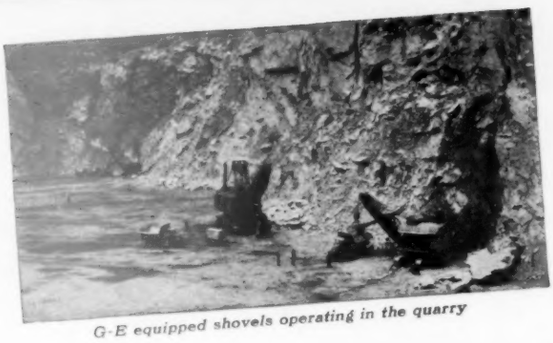
SAN FRANCISCO, CALIF. 500 Bush Street · SEATTLE, WASH. 1932 First Ave., So. · DALLAS, TEXAS 1304 McKinney Ave. · Tyee Machinery Company, Ltd. Vancouver, B. C. · The General Supply Co. of Canada, Ltd. Ottawa, Ont.

SHOVELS - DRAGLINES - CRANES

Hudson River Stone Corp. *with* Dependable



G-E equipped shovels operating in the quarry

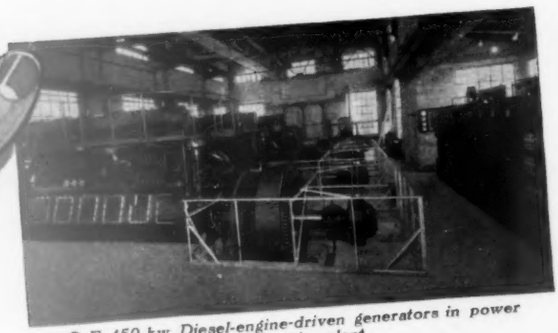
View of entire plant, showing concrete silos

MOVING a mountain to a river well describes the operations at the plant of the Hudson River Stone Corporation at Cold Spring, N. Y. Through modern production methods, in which the dependability of G-E equipment is an important factor, it is possible to quarry stone high up on a mountain overlooking the Hudson River and start it immediately through processes that continue to the bank of the river.

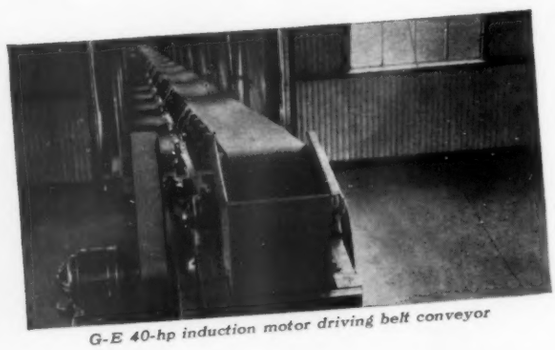
OPERATION IS PRACTICALLY CONTINUOUS

In this large, modern crushed-stone plant, which is electrified throughout and has a daily capacity of 2000 tons, operation is practically continuous. The rocks blasted in the quarry are picked up with G-E equipped shovels, placed in trucks, and carried to the primary-crushing building. There they are started through the crushing, washing, and screening processes that reduce them from great blocks to the sizes desired.

The entire operation is unified by electrically interlocked conveyors that connect one process to the next and distribute the product



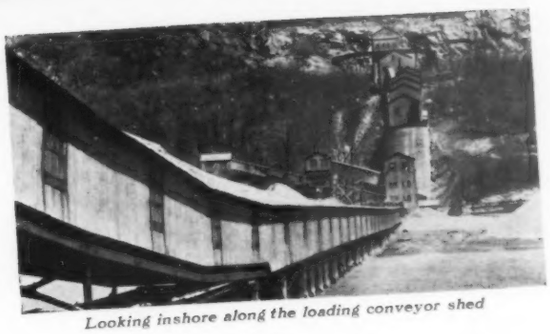
G-E 450-kw Diesel-engine-driven generators in power station supply power for entire plant



G-E 40-hp induction motor driving belt conveyor

GENERAL

Moves Mountain to River
G-E Equipment



Looking inshore along the loading conveyor shed

Loading operations at the dock

to the concrete storage silos or to barges, railroad cars, or trucks.

MOTORS SUITED TO THEIR JOBS

G-E motors drive the crushers, screens, conveyors, and pumps. Because each is exactly suited to its particular application and is operated by G-E matched control, it gives the most efficient, reliable performance possible. The sturdy construction and careful design of these motors enable them to withstand dust and vibration. Engineers at the plant say that these motors, during the several years they have been in operation, have given no trouble at all.

G-E Diesel-engine-driven generators are a reliable and economical source of power; and G-E transformers throughout the plant are further aids to low-cost, efficient operation.

Installations such as this show the advantages that G-E equipment can give you in *your* rock-products plant. Call the nearest G-E representative for further information. General Electric, Schenectady, N. Y.

G-E switchboard in power station

G-E synchronous motors driving the centrifugal pumps that supply water for washing operations

Notes on our trip to the Hudson River Stone plant

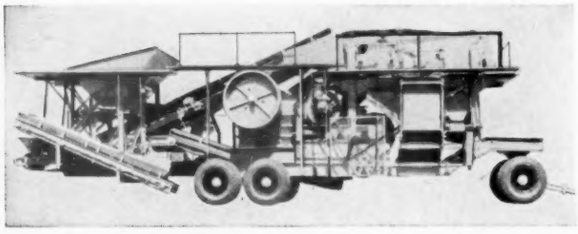
011-225

GE

ELECTRIC

UNIVERSAL BUILDS

a Plant for Every Crushing Job!



Regardless of requirements — Universal builds stationary, semi-portable and portable gravel and rock crushing equipments to meet any production schedules.

The Universal Line is complete — primary jaw crushers, secondary roll crushers, screening and conveying units, mechanical feeders and loading bins, portable and stationary washing plants. Available for spot or straight-line operation, mobile combinations consisting of charging hoppers, sand rejectors, gyrating screens, jaw and roll crushers, and mixing hoppers for either truck or bin delivery, are mounted on either steel wheels, solid rubber or pneumatic tires, as desired.

Universal Plants, because of their modern design—the culmination of more than thirty years of field study — are quickly set up, requiring no pits for delivery conveyors, and are easily moved from one operation to another. Construction is rugged throughout. Manganese Steel is used on wearing parts to fully resist impact and abrasion. Roller bearings and alemite fittings insure long time, continuous service. Crushing and screening processes are fast and thorough with Universals. *They produce more tonnage at a lower cost!*

Quick delivery of complete plants can be made from units on hand ready for assembly. Universal crushers in most sizes can be shipped from stock. Jig and template made replacement parts such as jaws, side plates, roll shells, roller and bronze bearings, etc., are stocked for every size and type of unit we make to eliminate costly breakdown tie-ups.

Send for operating reports and Catalog No. 134-A showing Universal installations.

Universal Crushing Equipment is sold by leading distributors everywhere!

ORIGINAL FORCE FEED UNIVERSAL CRUSHER

CRUSHERS
STATIONARY AND PORTABLE PLANTS
PORTABLE WASHING PLANTS
PULVERIZERS
CONVEYORS
ELEVATORS, SCREENS, FEEDERS AND BINS

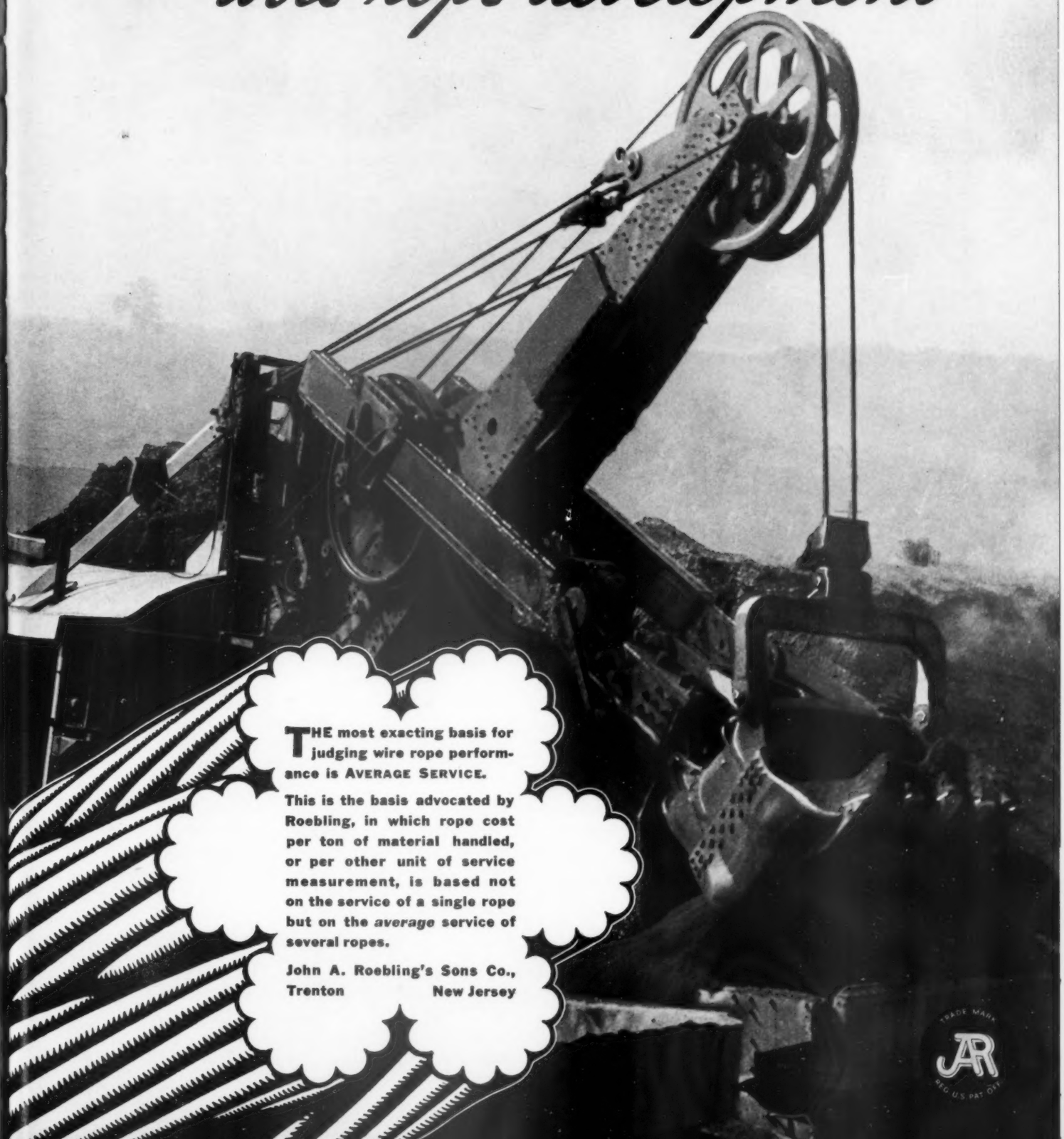
UNIVERSAL CRUSHER COMPANY

619 C Avenue West — Cedar Rapids, Iowa

UNIVERSAL

Roebling...

The pacemaker in wire rope development



THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.

John A. Roebling's Sons Co.,
Trenton New Jersey

TRADE MARK
JAR
REG. U.S. PAT. OFF.

We ask you to test

WILLIAMSPORT

PURPLE STRAND "Form-Set"

To decide on the wire rope that serves you best — handles more work because it lasts longer — we urge you to try Purple Strand "Form-set", preformed the Williamsport way.

This rope serves better and lasts longer: it is more compact, tougher, and has less internal stress. Compact, because the wires lay up tighter, without interstices, for each wire is exactly uniform — drawn through our Carboloy dies that always cut to the same micrometer precision. Tougher, because the wires have the highest tensile strength and they seat more firmly in the core. Less internal stress because "Form-Set" is preformed the Williamsport way — resists wear better, lasts longer.

We invite you to test Purple Strand "Form-Set" on the toughest job you have. Note its performance, compare its service record, and save with its greater endurance. Will you try this better rope?

WILLIAMSPORT WIRE ROPE CO.

Williamsport, Pa. 122 So. Michigan Ave., Chicago, Ill.

Other Offices in All Principal Cities

A NEW BOOK

For the Up-to-Date Producer

•

TIME CHANGES ALL THINGS — Specifications are tighter — costs are higher — competition is greater — many plants are too big and cumbersome — too expensive to operate, and often too far from the job.

THE NEW PIONEER WASHING PLANTS are

- Portable — which saves haul
- Compact — requires only one power unit
- Modern — and will meet strict tolerances
- Efficient — and will produce more material
- Anti-friction bearing equipped, and require less power, grease, and upkeep

And — There is a plant for every purpose and a size for every job.

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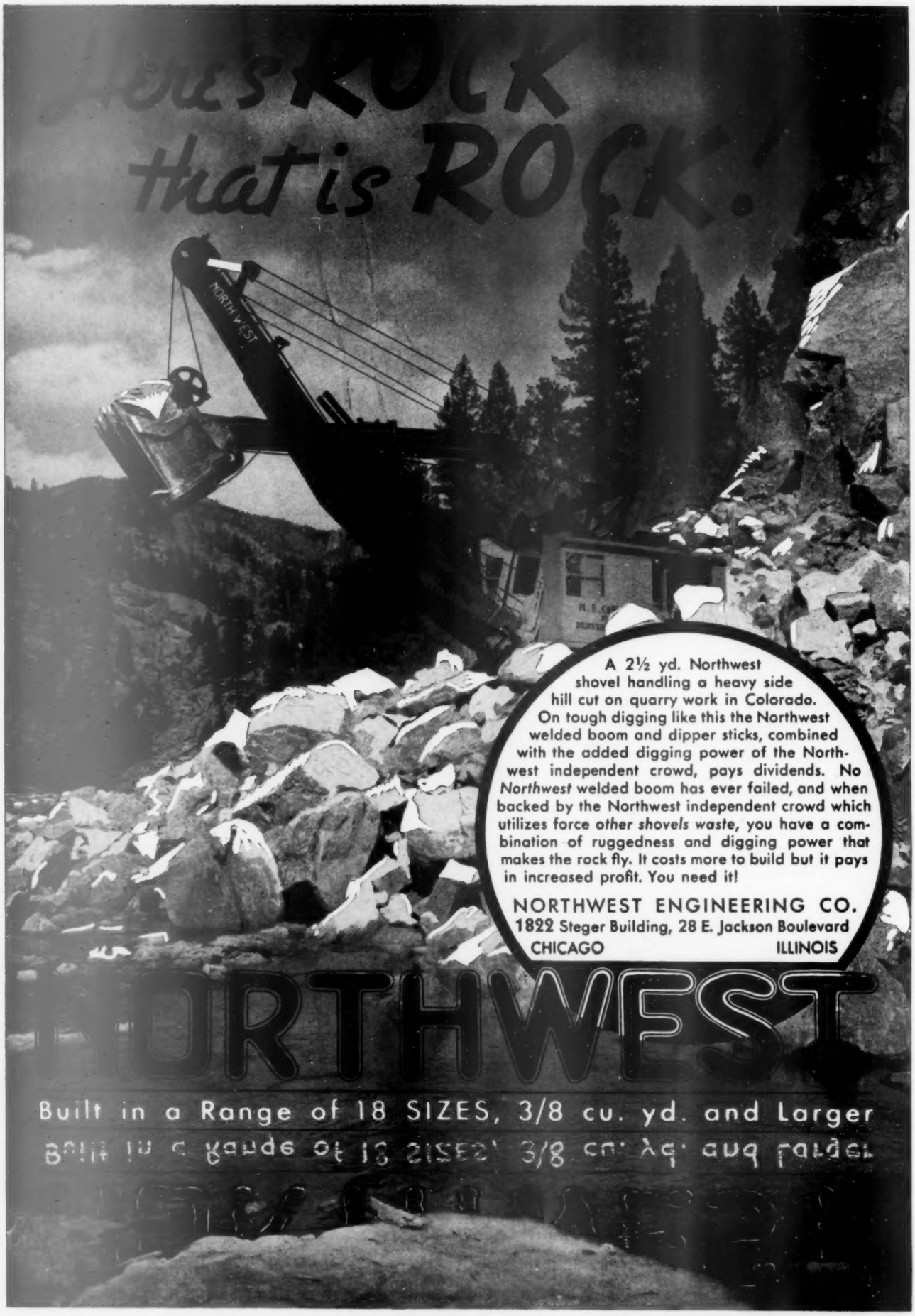
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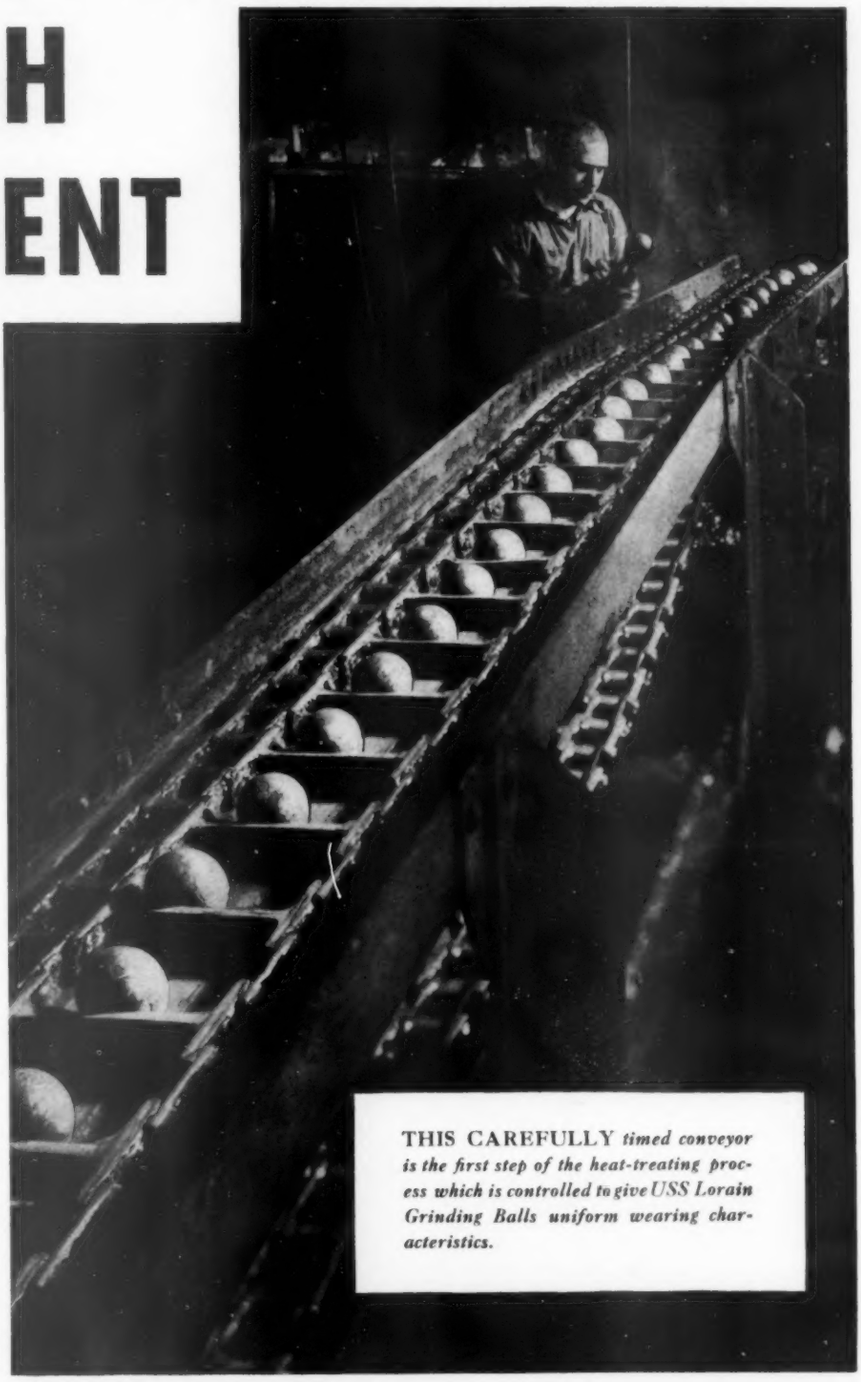

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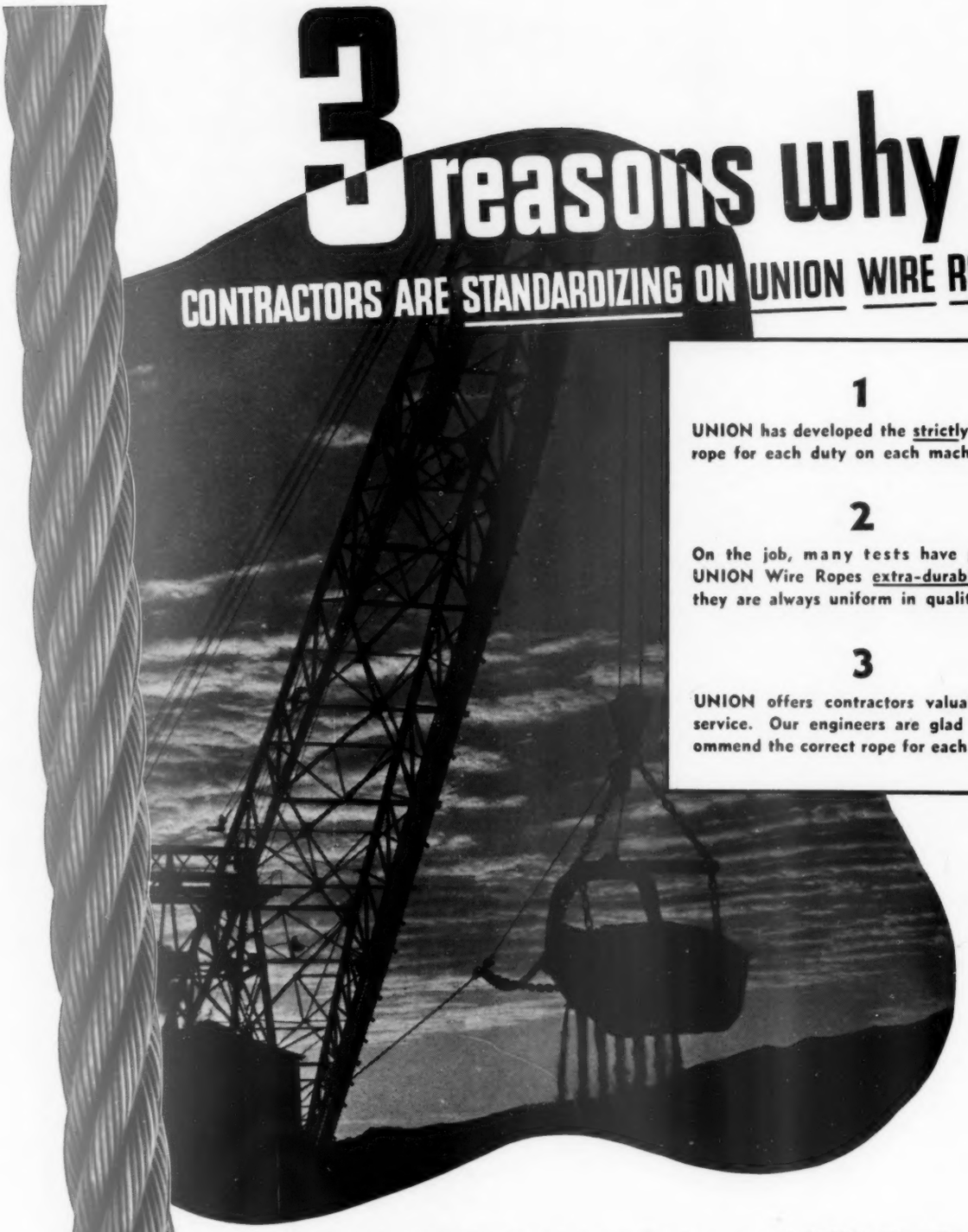

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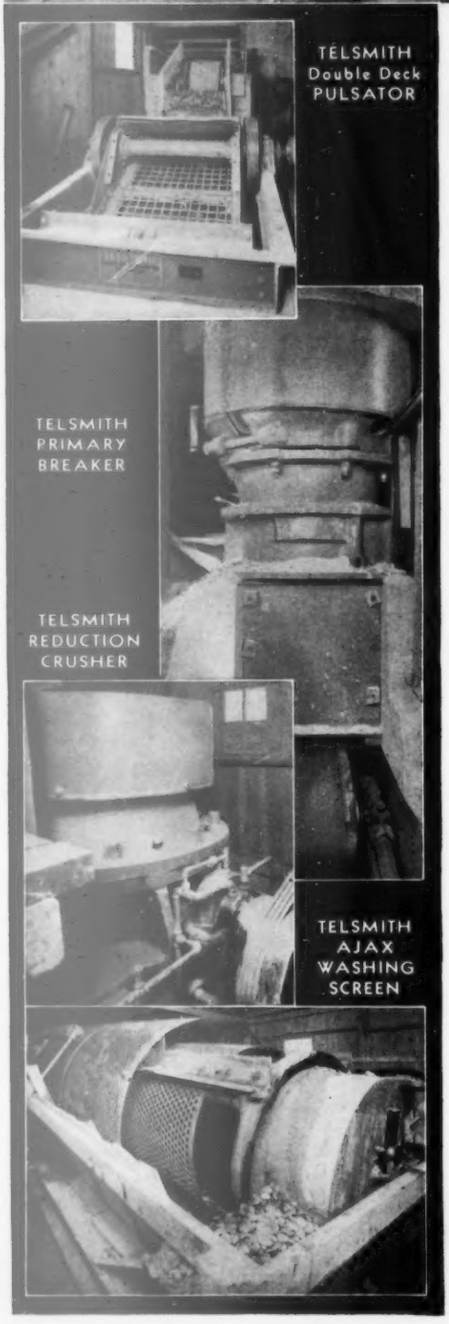

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G-2

TELSMITH

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PIT AND QUARRY

Vol. 30 July, 1937 No. 1

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H. W. BAUMGARTNER
President
STANLEY A. PHILLIPS
Vice-President and Directing Editor
Field Editor:
W. E. TRAUFFER
Assistant Editor:
HARRY F. UTLEY
Contributing Editor:
WILHELM CARL RIETH
Circulation Manager:
W. T. KLUSSMAN

Advertising Manager:
JAMES E. MONTGOMERY
Telephone HARrison 9357
Chicago, Ill.
Eastern Advertising Manager:
W. A. BUSCHMAN
Room 420, 122 East 42nd St.
Telephone CALedonia 5-4438
New York, N. Y.
Central Advertising Manager:
W. H. SANDERSON
Auditorium Bldg.
Telephone CHerry 6339
Cleveland, O.
Advertising Representatives:
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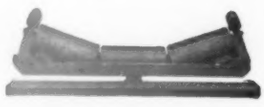

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PIT AND QUARRY

CHICAGO JULY, 1937

F. T. C. Attacks Cement Basing-Point System

PRODUCERS NAMED IN CHARGE

Charging a combination to eliminate price competition, resulting in increased prices for cement, the Federal Trade Commission has issued a complaint against The Cement Institute, an unincorporated association, its officers, and 75 cement-manufacturing member corporations, producing 95 per cent. or more of all the Portland cement made in the United States. The complaint alleges violation of the Federal Trade Commission Act and Sec. 2 of the Clayton Act as amended by the Robinson-Patman Act.

The complaint charges that the chief means employed for carrying the cement combination into effect is concerted use of the multiple-basing-point system of quoting prices. Under this system, it is alleged, identical delivered prices are made by every quoting producer entering into the combination to any given destinaiton in the United States. Instances of identical bids made by many producers to various Federal and state agencies are set forth in the complaint.

The commission's complaint sets out, in effect, that each producing company knows that, when it refrains from offering competitive prices in the consuming areas where it has a natural advantage and receives its highest actual price, it will receive the same freedom from price competition when the situation is reversed. In this way there is everywhere a reciprocal waiver of natural advantages with no competition in price anywhere.

The following co-operative methods, it is alleged, have been used by the producers in support of their combination:

They have refused to sell f.o.b. mill and will sell only at formula delivered prices.

They have employed the institute's freight-rate books for the computation of identical delivered prices regardless of whether the rates contained in the books are officially correct or not.

They have penalized customers where customers use trucks for delivery, but have monopolized for themselves the benefit of cheaper transpor-

(Continued on page 104.)

Vulcanite Cement Plant Is to Be Reopened

Plans have been made for the reopening of the Vulcanite Portland Cement Co. plant at Vulcanite, near Alpha, Pa., Albert Moyer, president of the company, has announced. He appointed Frederick B. Hunt, for the past 12 years assistant superintendent of the Nazareth Portland Cement Co. plant at Nazareth, superintendent, and S. Warren Hartwell, Easton, Pa., assistant superintendent and chief chemist of the plant.

A raw rock storage house is being built at the plant making it possible to select rock for various engineering specifications.

Silica Company Plans $250,000 Expenditure

★ The Century Silica Co., of Pittsburgh, Pa., E. Frank Wilson, vice-president, has taken over the former Foxburg Silica Co's property at Foxburg, Pa., and is now constructing an entirely new plant. It plans to use the glory-hole system of mining silica rock. The plant will be equipped with Buchanan crushers, Hardinge rod mill and classifiers, Hardinge rotary dryer, Stephens-Adamson screens, Redler conveyors, tanks, etc. The estimated total cost is $250,000.

Signing of Labor Agreements Reported

WAGES AND HOURS FIXED

The Dewey Portland Cement Co., with plants at Davenport, Ia., and Dewey, Okla., has signed a 2-year contract with the American Federation of Labor, and provisions of the contract were subsequently ratified at the Dewey plant at a meeting of the cement workers' union. Company officials, committees from the two local plant unions, and Harold Williamson, A. F. of L. representative and first vice-president of the cement council, negotiated the contract, at Kansas City, Mo.

The recently organized Mine, Mill and Smelter Workers Union organized by the Monolith Portland Midwest Cement Company mill employees, Laramie, Wyo., has been granted a CIO charter. R. A. Vandel has been elected president of the local union which will launch an organization campaign in the plant. The Union now claims 61 members out of 123 employed. Formal approval of the unionization was given by 103 of the 123 employes at the semi-final organization meeting in May.

Wage increases ranging from 5 to 7 per cent., installation of a check-off system, and the revision of hours for which overtime is paid are included in a new agreement negotiated by officials of the cement workers' local union with the Utica Hydraulic Cement Co., Utica, Ill. The 5-per cent. increase goes to employees in the mill and the 7-per cent. increase to those employed in the company's quarry.

The contract provides that time-and-one-half wages shall start after 8 hours, compared with 9 hours in

(Continued on page 31.)

Sheets President of Portland Cement Assn.

EX-ILLINOIS HIGHWAY ENGINEER

Election of Frank T. Sheets as president of the Portland Cement Assn., effective September 1, was announced July 1 by Charles L. Hogan of New York, chairman of the board. He succeeds Edward J. Mehren, who re-

Frank T. Sheets.

signed last month to take care of his personal interests.

Mr. Sheets for the past four years has been consulting engineer and director of development of the association. Prior to that time he had been associated with the Illinois Highway Department for twenty-three years and for twelve years as superintendent of highways and chief engineer.

Coming out of high school Mr. Sheets started to work in the Department of Highways as blueprint boy and file clerk. He then took time off to go to college, working his way through, being employed by the State Highway Department during the summer in order to get additional revenue for his education. At the completion of his college course he entered the Highway Department and in successive civil service examinations became assistant engineer, assistant bridge engineer, assistant maintenance engineer, bridge engineer, engineer of design and finally the top position of superintendent of highways and chief engineer. His selection for this position was based solely on his outstanding ability and the success with which he handled his successive jobs.

Mr. Sheets has served as president of the American Association of State Highway Officials, of the Mississippi Valley Highway Conference, of the Central Illinois section of the American Society of Civil Engineers. He was an official delegate from the United States government to the Pan-American Highway Congress at Rio de Janeiro in 1929.

His experience in the highway field covers practically all phases of highway financing, design, construction, maintenance and administration. During the twelve years ending January 1, 1933, he directed expenditures of over $450,000,000 for highway and bridge construction and maintenance and supervised construction of approximately 11,600 miles of highways in the state of Illinois of which 8,356 miles were high type primary roads.

He is the author of "Concrete Road Design, Simplified and Correlated with Traffic," presenting sound and simplified methods of designing pavements to meet traffic expectancy. He has, during the past few years directed the administrative and technical policies of the Highways Bureau of the association, and has directed industrial research to develop new and improved uses of portland cement and concrete, in addition to performing his duties as consulting engineer.

Triangle Gravel Forms Ready-Mixed Division

★ Triangle Rock & Gravel Co., San Bernardino, Cal., has formed a new division, under the name of Triangle Certified Concrete, Inc., to operate a ready-mixed concrete business. Neal O. Baker, president and general manager of the sand and gravel company, is also president of the concrete division. George Thwing, engineer formerly with Winston Bros., will be manager of the concrete business, and the company is prepared to prepare estimates and discuss engineering problems with builders. Roy O. Stewart will be in charge of transportation.

Two 10-ton Ford trucks with 3-yd. Jaeger mixers have been put in operation for the new business.

N. R. M. C. A. Convention Time and Place Set

The executive committee of the National Ready Mixed Concrete Assn. held its mid-year meeting at the Hotel Statler, Buffalo, N. Y., on June 23. It decided on the Netherland-Plaza Hotel, Cincinnati, and the week of Jan. 31, as the place and time of the association's 1938 convention.

Discuss Standards of Dust-Control Practice

EQUIPMENT MAKERS MEET

The Dust Control Equipment Assn. at its meeting in Cleveland early in June gave careful attention to reports from the Engineering Committee of the association dealing with work in establishing standards of dust control practice.

The association endorsed the recommendations of the engineering committee with regard to the adoption of a friction chart and the development of a formula for use in connection with that chart.

During the meeting the association was addressed by Theo. Hatch, associate dust control engineer, Division of Industrial Hygiene, Department of Labor, State of New York, on the subject "Importance of Modern Standards and Methods of Dust Analysis upon Design and Efficiency of Dust Control Equipment."

Mr. Hatch, who spoke in the light of his personal knowledge and opinions rather than as representing the rules and regulations of the Division of Industrial Hygiene of his home state, discussed methods used in cleaning dust from air in South African gold mines. He went into considerable detail on the question of the size of dust particles and the relative importance of the different kinds of dust. He then discussed in some detail the various types of equipment available for determining dust count and showed why he considered it unsatisfactory to attempt to establish factors on the basis of a very close determination.

Cement Makers Liable For Alabama Sales Tax

Judge Walter B. Jones in Montgomery (Alabama) circuit court on May 28 ruled that Alabama cement manufacturers were liable for the state 2 per cent. sales tax. Judge Jones said, in a declaratory judgment, that cement manufacturers who sell in carload lots or larger quantities were liable for payment of the tax on their gross receipts within the state. The ruling was issued in a case brought against the state tax commission by the Lone Star Cement Corp., Lehigh Portland Cement Co., Alpha Portland Cement Co. and National Cement Co.

Bartlesville, Okla., will have its first ready-mixed concrete plant soon, being built by the Baughman Lumber Co.

Cincinnati Gets 1938 Gravel Convention

DIRECTORS HOLD MEETING

The summer meeting of the board of directors of the National Sand & Gravel Assn. was held at the Statler Hotel, Buffalo, June 24 and 25. Thirteen officers and members of the board attended.

The association's 1938 convention will be held Feb. 1-3 at the Netherland-Plaza Hotel, Cincinnati, the board decided. The budget for the second half year, amounting to $25,271, was approved. It was also decided that the association should join the American Concrete Institute and the United States Chamber of Commerce.

V. P. Ahearn, executive secretary, presented a detailed report which dealt with the industry's production, construction activity, highway building, diversion of highway funds, etc. He also discussed at length Federal legislation and prospects. He stated that during its 21 years of continuous existence, the association has cost the industry only .04 per cent. of the value of its output.

Stanton Walker, director of engineering, reported on the activities of his department and urged again an extension of the association's research activities.

Interesting, enjoyable and carefully-planned entertainment was provided by H. N. Snyder and his fellow Buffalo producers, who arranged separate parties for the men and their wives. Dinner and an evening at Niagara Falls and an afternoon at the Wanakah Country Club were the outstanding features.

The following persons attended:

BOARD MEMBERS AND OFFICERS

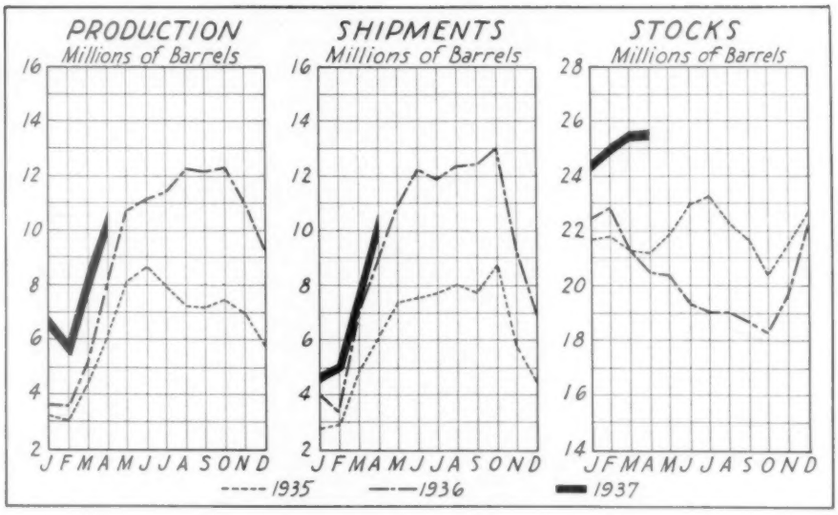
V. P. Ahearn, *executive secretary.*
W. A. Bliss, Keystone Sand & Supply Co., Pittsburgh, Pa.
Otto S. Conrades, St. Louis Material & Supply Co., St. Louis, Mo.
Alex. Foster, Jr., Warner Co., Philadelphia, Pa., *president.*
J. Rutledge Hill, Gifford-Hill & Co., Dallas, Tex., *vice-president.*
C. S. Huntington, Link-Belt Co., Chicago, Ill., *chairman, Manufacturers' Division.*
W. H. Klein, Dixie Sand & Gravel Co., Chattanooga, Tenn.
Daniel J. Miller, Portland Sand & Gravel Co., Portland, Pa.
M. A. Neville, Western Indiana Gravel Co., Lafayette, Ind.
J. M. Settle, Ohio River Sand Co., Louisville, Ky.
J. L. Shiely, J. L. Shiely Co., St. Paul, Minn.
H. N. Snyder, Buffalo Slag Co., Buffalo, N. Y.
Stanton Walker, *director of engineering.*

GUESTS

W. E. Hale, American Aggregates Corp., Greenville, O., *president,* Ohio Sand & Gravel Assn.
H. V. Owens, Eastern Rock Products Co., Utica, N. Y.
Stanley A. Phillips, PIT AND QUARRY, Chicago, Ill.
N. C. Rockwood, ROCK PRODUCTS, Chicago, Ill.
Stephen S. Stepanian, Columbus, O.

LADIES

Mrs. V. P. Ahearn and daughters, Washington, D. C.
Mrs. W. A. Bliss, Pittsburgh, Pa.
Mrs. Alex Foster, Jr. and daughters, Philadelphia, Pa.
Mrs. W. H. Klein, Chattanooga, Tenn.
Mrs. Stanley A. Phillips, Evanston, Ill.
Mrs. H. N. Snyder, Buffalo, New York.



The Portland cement industry in April, 1937 according to U. S. Bureau of Mines statistics, produced 10,315,000 bbl., shipped 10,265,000 bbl. from the mills, and had in stock at the end of the month 25,636,000 bbl. Production and shipments of Portland cement in April, 1937 showed increases, respectively, of 19.8 and 11.8 per cent., as compared with April, 1936. Portland cement stocks at mills were 24.6 per cent. higher than a year ago.

The mill value of the shipments—17,731,000 bbl.—in the first quarter of 1937, is estimated as $26,738,000. According to the reports of producers the shipment totals for the quarter include approximately 640,000 bbl. of high-early-strength Portland cement with an estimated mill value of $1,199,000.

The relation of production to capacity was 48.8 per cent. as against 39.2 in April, 1936.

Monolith Builds Eight New Concrete Silos

★ Monolith Portland Cement Co., Monolith, Cal., is building a set of eight concrete silos 20-ft. diameter and 52 ft. high. The silos have screw conveyors below with spouts discharging into a screw conveyor which delivers into a surge bin over a Fluxo pump, whence the cement is pumped into the packer bins in the pack house through an underground tunnel, a distance of about 600 ft.

The new silos were built to take care of the output of a new F. L. Smidth 8-ft. 4-compartment mill, 200-bbl. capacity. A Fluxo pump is used to convey the finished cement from the mill room to the new silos, a distance of about 300 ft.

Labor

(from page 29)

the old agreement. There is also a provision stipulating that in case conditions warrant the wages section may be re-opened within the next six months for the purpose of considering additional wage increases.

A wage and working-time agreement was signed recently by the Utah Rock Asphalt Co., Price, Utah, and a local union affiliated with the C. I. O., culminating a period of amicable negotiations. Wage increases of 50c per day for unclassified labor and 75c per day for skilled workmen and helpers, time-and-a-half for overtime, recognition of the seniority rule and methods for handling disputes were the principal points in the agreement, which will be effective for a one-year period.

Considerable delay in reaching an accord was experienced because of the necessity of classifying the workmen at the quarry and mill. As this is the only industry of its kind in the state to be organized, neither side had a precedent to follow.

★ J. W. Harding of Evansville, Ind., is erecting a building and installing machinery at Gladstone, Ill., to be used for the grinding and mixing of molding sand. The sand will be dug from nearby pits and hauled to the plant for preparation for shipment.

Mid-Year Meeting of Crushed-Stone Board

1938 CONVENTION IN CINCINNATI

At White Sulphur Springs, 24 directors of the National Crushed Stone Assn. assembled on June 17 for the board's regular mid-year meeting. The session was held at the Greenbrier, historic hostelry in the scenic West Virginia mountains.

The routine matter of deciding on the place and date of the 1938 convention was disposed of promptly by selecting the Netherland-Plaza Hotel, Cincinnati, as the place and the 24th to 27th of January as the time.

Administrative Director J. R. Boyd presented a detailed report on the association's activities in legislative matters, and A. T. Goldbeck, engineering director, spoke on its engineering work.

The following persons were present at the meeting:

MEMBERS OF THE BOARD

H. E. Rodes, Franklin Limestone Co., Nashville, Tenn., *president.*
W. M. Andrews, Union Limestone Co., New Castle, Pa.
W. P. Beinhorn, Trap Rock Co., Minneapolis, Minn.
L. J. Boxley, Blue Ridge Stone Corp., Roanoke, Va.
J. R. Boyd, *administrative director.*
F. O. Earnshaw, Carbon Limestone Co., Youngstown, O.
A. T. Goldbeck, *engineering director.*
Otho M. Graves, General Crushed Stone Co., Easton, Pa.
N. E. Kelb, Ohio & Indiana Stone Co., Indianapolis, Ind.
E. J. Krause, Columbia Quarry Co., St. Louis, Mo.
M. S. Lambert, Robins Conveying Belt Co., Chicago, Ill., *chairman*, Manufacturers' Division.
Thos. McCroskey, American Limestone Co., Knoxville, Tenn.
W. T. Ragland, Raleigh Granite Co., Raleigh, N. C.
H. E. Rainer, Federal Crushed Stone Co., Buffalo, N. Y.
Russell Rarey, Marble Cliff Quarries Co., Columbus, O.
J. A. Rigg, Acme Limestone Co., Fort Spring, W. Va.
Daniel Sanborn, Lehigh Stone Co., Kankakee, Ill.
James Savage, Buffalo Crushed Stone Co., Buffalo, N. Y.
F. W. Schmidt, Jr., Morris County Crushed Stone Co., Morristown, N. J.
L. W. Shugg, General Electric Co., Schenectady, N. Y.
W. C. Sparks, Cedar Bluff Quarry, Princeton, Ky.
Stirling Tomkins, New York Trap Rock Corp., New York, N. Y.
T. I. Weston, Weston & Brooker Co., Columbia, S. C.
A. L. Worthen, New Haven Trap Rock Co., New Haven, Conn.

GUESTS

J. E. Boyd, Weston & Brooker Co., Columbia, S. C.
R. P. Immel, American Limestone Co., Knoxville, Tenn.
S. C. Hadden, Indiana Mineral Aggregates Assn., Indianapolis, Ind.
A. W. McThenia, Acme Limestone Co., Fort Spring, W. Va.
Stanley A. Phillips, PIT AND QUARRY, Chicago, Ill.
N. C. Rockwood, ROCK PRODUCTS, Chicago, Ill.
R. B. Shepard, Raleigh Granite Co., Raleigh, N. C.
P. J. Walsh, West Virginia Contractors' Assn., Charleston, W. Va.

LADIES

Mrs. W. M. Andrews, New Castle, Pa.
Mrs. Graeme C. Bannerman, Washington, D. C.
Mrs. W. P. Beinhorn, Minneapolis, Minn.
Mrs. L. J. Boxley, Roanoke, Va.
Mrs. J. R. Boyd, Washington, D. C.
Mrs. F. O. Earnshaw, Youngstown, Ohio.
Mrs. Hart, Nashville, Tenn. (Daughter of Mr. and Mrs. H. E. Rodes.)
Mrs. A. W. McThenia, Ft. Spring, W. Va.
Mrs. S. A. Phillips, Evanston, Ill.
Mrs. W. T. Ragland, Raleigh, N. C.
Mrs. H. E. Rainer, Buffalo, N. Y.
Mrs. J. A. Rigg, Ft. Spring, W. Va.
Mrs. H. E. Rodes, Nashville, Tenn.
Mrs. R. B. Shepard, Raleigh, N. C.
Mrs. P. J. Walsh, Charleston, W. Va.

The ladies were the guests of the association for lunch at the Kate's Mountain Inn on the side of Kate's Mountain near the hotel.

★ The California Portland Cement Co., Colton, Cal., has purchased a No. 185-OB heavy-duty oil-bath type Air-Maze air filter. The unit is intended for protection of equipment from abrasive particles.

Unemployment Law of 45th State Approved

TOTAL COVERAGE NOW 18,678,000

With approval by the Social Security Board of the recently enacted Delaware unemployment compensation law, 45 States, the District of Columbia and Alaska now have such approved legislation. In addition, Hawaii, on May 18, passed an unemployment compensation law which has not yet been reviewed by the Social Security Board.

Estimates of the Board indicate that about 45,000 persons are in jobs covered by the new Delaware law, bringing the total of workers employed in jobs covered by unemployment compensation laws in the District of Columbia and the 45 States to approximately 18,678,000. Current estimates for Alaska are not available. Only 3 states—Florida, Illinois, and Missouri—remained without unemployment compensation laws at the time of this report.

Foundrymen Tour Plants of Silica Sand Company

A group of foundrymen and other interested persons, under the auspices of the Metropolitan Philadelphia chapter of the American Foundrymen's Association, on June 11 made a tour of the plants of the New Jersey Silica Sand Co., Millville, N. J.

The itinerary and schedule included a visit of the Millville gravel deposit, the molding sand plant No. 60, the No. 9 plant where medium and coarse gravel are screened, the No. 8 wash plant producing sub-angular sands for radiators and other uses, the No. 7 plant where molding sands are milled and prepared for loading, the No. 7 plant where round-grain steel sands, etc., are washed, graded and loaded, the drying plant of the National Pulverizer Co., and the company office and laboratory.

In the evening the party was driven to the Cumberland Hotel, Bridgeton, N. J., where a shore dinner was served.

Visitors at the plants of the New Jersey Silica Sand Co., Millville, N. J., June 11, under the auspices of the Philadelphia Chapter, American Foundrymen's Assn.

Johns-Manville Buys Additional Plant

NEW INSULATION TO BE MADE

Lewis H. Brown, president of Johns-Manville Corp. has announced that the corporation has concluded negotiations for purchasing the Richmond, Ind., plant of the Fibre Conduit Co. and intends to begin installation of equipment for manufacturing a new type of low temperature insulation. The Fibre Conduit Co. is consolidating its manufacturing activities in its Orangeburg, N. Y. factory.

The plant, with 150,000 square feet of floor space, consists of three brick and steel buildings and a power plant, located on a 30-acre site which is served by a spur from the Pennsylvania Railroad. The plant, for the present, will be used exclusively for the production of this new material, Mr. Brown said, but because of its strategic location in the Mid-West market may later be used also for the production of some Johns-Manville building material products.

This is the second new manufacturing unit to be announced by the company recently, work being scheduled to start soon on the construction of a plant near Los Angeles, Cal., for the manufacture of rock wool home insulation and transite-asbestos-cement pipe. With the establishment of these two new plants, the company and its subsidiaries will have in operation twelve plants in the United States and one in Canada.

The Johns-Manville Corp. has one plant at Alexandria, Ind., and also a limestone quarry there for the production of rock wool.

Output of Concrete Blocks Is Trebled

★Caruthersville Sand and Gravel Co., Caruthersville, Mo., has recently installed additional mixing and block equipment enabling it to treble its former output of concrete blocks. Blocks are furnished plain, brick face or panel face, and, if desired, are waterproofed. The product is promoted as a strictly "home product" for concrete home and building construction.

Chandler Materials Co. Takes Over Other Firms

Effective July 1 the Chandler Materials Co., Tulsa, Okla., has purchased all the physical assets, accounts receivable and good will of the Hughes Stone Co., Oklahoma Cement Pipe Co., Price Sand Co., and O. K. Sand Co., and assumed all liabilities of those corporations, according to an announcement by J. M. Chandler, president.

The business heretofore handled by the companies mentioned will in the future be handled without change in management or policy.

Calaveras Adopts Group Life-Insurance Program

Calaveras Cement Co., San Francisco, Cal., has adopted a group life insurance program providing employees with a total of approximately $200,000 life insurance.

All employees at the office in San Francisco and at the mill at San Andreas with three months or more of service are eligible to participate in the plan. The amounts of insurance are based on past and future service with the company.

Cement and Quarrying Operations Tabulated

A tabulation showing number of establishments, number of employees, and amount of pay rolls reported to the U. S. Bureau of Labor Statistics by cooperating firms in the cement and the quarrying and nonmetallic mining industries in March and April 1937, is compiled by Isador Lubin, commissioner, as follows:

	Establishments	*Number of Employees*	*Pay Rolls (1 week)*
Cement			
March 1937	144	21,916	$536,560
April 1937	144	23,067	587,837
Percent. change		+5.3	+9.6
Quarrying and nonmetallic mining			
March 1937	1,106	36,917	$779,302
April 1937	1,106	39,914	906,177
Percent. change		+8.1	+16.3

Farm-Land Development Creates Pipe Demand

Development of over 40,000 acres of new farm land has created a heavy demand for concrete pipe and headgates, and has led to the installation of a concrete products factory at Casa Grande, Ariz., by the City Transfer Co., of which Jean A. M. Vallette is president.

The company is now making 6 to 12-in. concrete pipe and headgates. By late fall it intends to make larger sizes up to 24-in., and will then go into the manufacturing of concrete block, brick and foundation blocks, and other articles for which there may be a demand.

St. Mary's New Silos To Triple Capacity

LARGE BAGGING ROOM ADDED

★The construction of four storage silos has just been completed at the plant of the St. Marys Cement Co., St. Marys, Ont. The bins which are connected in series fashion are heavily reinforced with steel and will hold approximately 130,000 bbl. of cement. They will more than triple the storage capacity of the St. Marys Cement Co. and will enable the efficiency of the mill to be considerably improved. The additions required 1920 yd. of concrete and 300 tons of reinforcing steel. The foundations for the silos were constructed five years ago and required 2,000 yd. of cement. Work was stopped at that time owing to the sudden depression in the building industry.

The silos were constructed by Carter, Hall and Aldinger, grain elevator contractors, with Ontario office in Toronto.

The St. Marys Cement Co. is also erecting a large bagging room near the towers. Screw conveyors and chutes will deliver the cement from the bottom of the various silos to the bagging room.

Monarch Cement Co. Gives Paid Vacations

In appreciation of the loyalty and faithfulness of its employees the Monarch Cement Co., Humboldt, Kan., is granting its men vacation periods with pay in accordance with the time of their continuous employment as of June 1, 1937. Vacation periods will range from one to two weeks and will be taken at a time most convenient. Some of the employees will be given a bonus when the plant shuts down rather than taking a vacation at a busy time.

Additional Handling Equipment Installed

★Additional material-handling and weighing equipment has been installed by the Concrete Supply Co., Evansville, Ind., producer of ready-mixed concrete. Included in the new equipment is a 300-ton sand and gravel bin. Two more mixing trucks have also been added to the company's equipment, making a total of 11 in operation.

. . . Editorial . . . . . .

Intimidation in Labor Disputes

ALTHOUGH MOST of us seem to have accepted war, individual homicide, robbery with a gun, kidnapping and other crimes dependent on the use of violence as inescapable evils, we still display astonishment when labor disputes take a violent turn. For some quite unaccountable reason we expect employers and workers to be more logical and less emotional under stress than soldiers on the battlefield, fighters in the ring, or argumentative boys on their way home from school. We calmly observe all the circumstances that lead to a dispute, all the excessive demands and stubborn resistance that characterize present-day industrial relations, all the aggravating and threatening acts of both parties, and then raise our hands in horror when the two sides leave the conference room and take to the open field.

This passage from the stage of persuasion to that of violence in labor disputes occurs so naturally, sometimes so obscurely and often so quickly, that the parties interested have cracked one another's heads and shed one another's blood before the public is aware that there are really serious points of controversy. The bridge that makes the passage so easy is that sort of "no man's land" of intimidation, at which men arrive when they feel that the usefulness of debate has been exhausted and the necessity for violent action is rapidly approaching. Those who cross the bridge are often unaware of the steps they take; they move unseeing and unseen from the realm of permissible intimidation to that of not-permissible intimidation without any realization of the significance of the change and with little or no suspicion of the policies to which it commits them. Even our courts, which have necessarily given much consideration to practices that have in a generation, have been unable to offer a marked almost every important labor conflict definite formula for determining when intimidation is or is not permissible.

Most courts seem to have held that picketing, which is the form of intimidation most obvious to the public because it is the one most talked about, is legal provided it is done without "unlawfull intimidation", which seems to imply that some forms of intimidation may be lawful. Yet in Chicago in 1921 the Illinois Appellate Court said, "There is no such thing as peaceful picketing" [221 Ill. App., 229, 303], and again, "The very fact of establishing a picket line by the appellants is evidence of their intention to annoy, embarrass and intimidate the employees of the appellee, whether they resorted to physical violence or not" [221 Ill. App., 322, 336]. Picketing done for the purpose of persuading workers to join the cause for which strikers have left their jobs was accepted as a right open to picketing workers by Chief Justice Taft in a United States Supreme Court decision in the same year, but he declared that "if . . . the offer is declined, as it may rightfully be, then persistence, importunity, following and dogging become unjustifiable annoyance and obstruction which is likely soon to savor of intimidation".

THE purposes of picketing are threefold: (1) To inform those unaware of it that a strike is in progress; (2) to persuade employees remaining at work to join the strike; and (3) to prevent by moral suasion or, if necessary, by physical obstruction non-striking employees from going to work. The so-called "sit-down" strikes of recent years have accomplished the same ends and, although they violate property rights and are objectionable on that account, have probably reduced the amount of violence by reducing the frequency of physical encounters between strikers and non-strikers. When violence occurs, as it usually does after prolonged strikes and the development of bitterness which increases as time goes on, it is difficult if not impossible to fix the blame for initiating it. At times both sides make definite plans for resistance or attack, and *provocateurs* and rowdies, employed by one side or the other, may be instructed to instigate trouble in such a way as to cast on the other party to the conflict the suspicion of having been the first to make use of violence.

Picketing is not the only form of intimidation common to labor disputes, but it is one of the most important, most effective, and most likely to lead to violence. While it aims at informing the public of the existance of a strike, its chief purpose is making the strike successful, for the attainment of which objective it is essential that employees continuing work be added to the striking group and that they be prevented from working. Mass demonstrations and scurrilous language directed at those going to and returning from work represent one extreme in the picketing technique; peaceful attempts at persuading them to join the strikers' ranks by conveying the strikers' views to those who are innocently or deliberately aiding in the employer's attempt to break the strike stand at the other extreme. Pickets may visit workers' homes to try to persuade them to leave their work, or may approach them on the streets or at the job. Their attitude toward "innocent" strikebreakers is likely to remain persuasive in character, but that toward professional strikebreakers is almost certain to be hostile and to terminate in violence.

THE United States Commission on Industrial Relations reported some time ago that "the greatest disorders and most acute outbreaks of violence in connection with industrial disputes arise from the violation of what are considered to be fundamental rights, and from the perversion or subversion of governmental institutions". Whether conservative or radical, all workers consider as basic their right to live and — since working is always (in their class at least) essential to living — their right to work. They do not look upon employment as an act of philanthropy on the part of employers, and they certainly do not believe, as Alfred Krupp once expressed it, that workers should be "grateful in soul and body that we offer them bread". While they insist upon their own right to work as fundamental and indisputable, they seldom concede even to workers who engage in strikebreaking to avoid starvation, and certainly never to professional strikebreakers, "the abstract individual right of any worker to work whenever, wherever and under whatever conditions he chooses". To them the strikebreaker is not the "national hero" that Charles W. Eliot declared him to be.

Several forms of intimidation have been adopted by employers, and these have frequently been the causes of strikes. Many employers have threatened with discharge any worker who joins a labor union, and many have required all their workers to sign "yellow-dog" contracts. It has been estimated that in 1930 more than a million workers were employed under such contracts, which, while they gave the workers no guarantee of employment, insured the employers against the organization of their employees. Even though the employment provided was the sole consideration offered for the worker's agreeing to refrain from joining a union and was considered terminable at the will of the employer, the courts have had a tendency to follow the lead of the United States Supreme Court's decision in Hitchman Coal & Coke Company *v.* Mitchell [245 U. S. 229 (1917)] which held that those who attempted to persuade workers employed under "yellow-dog" contracts to join a union without notifying their employer or quitting their jobs could be enjoined by a suit filed by the employer. As a corrective the Congress in 1932 passed the Norris-La Guardia anti-injunction act which declared such contracts contrary to public policy and unenforceable in the federal courts by injunction or otherwise.

In many organizations union organizers among the workers are spied upon and discharged to instill fear in those who remain at work. In so-called "company" towns employers sometimes practice intimidation by warning their workers that "disloyalty" to their employers will result in the termination of credit at the company stores or in their eviction from company-owned houses. In some cases where unions are already well established intimidation may take the form of prosecutions of conspicuous labor leaders, as in the Mooney case, and in such an event the employer may have the tacit support of ultraconservative elements in trade unions themselves. Attempts may be made to turn public opinion against the unions by accusing organized labor of being responsible for the high cost of living or of a decline in export trade.

INTIMIDATION of all kinds thrives in a civilization such as ours, which values material success above all else. From toleration of intimidation in its milder forms it is but a step to acceptance of intimidation and violence in their worst forms as a legitimate part of daily life. The increasing insecurity of large masses of workers offers the opportunity of success to those who utilize intimidation, as does also the lessening of the opportunities open to those in that social stratum between the business and professional classes and the working class. Unless we can find some surer foundations on which to erect a social system other than the pecuniary base that underlies our present civilization we may expect to see less and less use made of persuasion and more and more reliance placed on intimidation and the violence which grows so easily out of it.

Important Reports and Papers Presented at A.S.T.M. Meeting

REPORTS of three committees and three technical papers featured the Fourteenth Session of the Fortieth A. S. T. M. Annual Meeting devoted to the subject of cement and concrete.

While Committee C-1 on Cement had included in its report proposed Specifications and Methods of Test for Blended Cements, action was taken at the annual meeting to refer this back to the committee for further consideration because of a divided committee vote. Proposed revisions in the Tentative Method of Test for Compressive Strength of Portland-Cement Mortars were approved and a revision for immediate adoption in the Specifications for Portland Cement (C 9-30) will be referred to society members by letter ballot. The principal revision in C 109 is the introduction of more definite methods of molding the specimen. The change in the Portland Cement Specifications C 9 provides for the elimination of the fineness test of cement on the No. 200 sieve. Data developed by a special working committee show that sieve residues bear little or no relation to the fineness as indicated by specific surface. In the working committee's report it was indicated that "the general opinion is that the present fineness requirement in the cement specifications has been meaningless for many years. This requirement should either be eliminated, or if a fineness test is deemed necessary by a majority, it should be replaced by some method that furnishes dependable information on particle-size distribution, specific surface, or minimum percentage of some fine fraction designated by maximum particle size."

It is pointed out in the Report of Committee C-1 that in the present transitional stage the society's standards for hydraulic cements exhibit quite a difference in fineness requirements, and this fact illustrates the need for the active work which the Working Committee on Fineness has under way.

L. S. Brown of the Lone Star Cement Corp., in his paper, *Tricalcium Aluminate and the Microstructure of Portland Cement Clinker*, pointed out that:

"Recognition of C_3A in Portland-cement clinker by microscopic examination has been found exceedingly difficult. To determine its mode of occurrence, that is, its relation to the structure of clinker, about 150 experimental burns were made ranging from pure C_3A through high-alumina silicate mixes into the field of Portland-cement compositions. The charges were examined in thin sections, especially prepared to yield optimum clarity.

"It is found that C_3A crystallizes in large units, inclosing C_3S, and CaO when present, but with a tendency to exclude C_4AF. In this habit C_3A becomes a matrix or interstitial material which, because of its close similarity in optical properties to those of C_3S, its presence usually in minor amounts, and general lack of crystal outlines in silicate mixes, is quite difficult to distinguish. Its presence is demonstrated indirectly through its control over the orientation of C_4AF crystallites, which show a common mass or field birefringence over large, roughly equidimensional areas. The common lack of such criteria in commercial clinker indicates that crystalline C_3A is not present in the amounts generally calculated."

H. H. Scofield of Cornell University, outlined *Some Tests to Show the Effect of Freezing on the Permeability, Strength, and Elasticity of Concretes and Mortars*. Some 1,500 test specimens were made and tested, employing six different types of cements with sand and gravel as aggregates. The specimens were frozen immediately or subjected to a delayed freezing cycle.

"The average loss in strength for concretes immediately frozen ran from about 40 to 60 per cent. of the normal unfrozen strength at the same age. There was no systematic difference between the 1- and the 7-day freezing period, nor between rich and lean concretes. Dry concretes and those tested at 1 and 4 yr. seemed to show less proportionate percentage loss.

"The permeability tests showed a large increase in leakage for the frozen specimens, especially for those frozen 7 days. This was however proportionately much less for 1-yr. tests than for 7-day tests.

"If the specimen was cured 24 to 47 hr. in warm dry air before freezing, practically no injury was done to the concrete. Cooler moist air precuring necessitated somewhat longer precuring before freezing in order not to injure the specimens."

An outstanding paper was the one by R. E. Davis, H. E. Davis, and E. H. Brown, University of California on *Plastic Flow and Volume Changes of Concrete*, giving the results of important research work carried on over many years having to do with volume changes of concrete and pointing out the significance as applied to design and construction problems. The authors point out that as a result of the research of recent years, there has been developed a general conception of the effect of shrinkage and plastic flow upon the behavior of concrete structures, which is already leading to marked changes in design and construction practices.

It is now generally believed that shrinkage and plastic flow are closely related phenomena, each being primarily due to changes in the amount of absorbed water in the cement gel and being but little directly influenced by the free water occupying the pore spaces within the concrete mass.

On the whole, plastic flow does not seem to be an undesirable property. In certain reinforced-concrete members it tends to make possible the more efficient use of steel, and in thin structures subjected to drying, as well as in mass structures subjected to thermal changes due to the hydration of cement, it tends to promote a more favorable distribution of stresses than would otherwise exist.

Recent series of tests, undertaken during the period 1934 to 1937, have included studies to determine (1) effect of water-cement ratio and aggregate-cement ratio upon plastic flow, (2) effect of fineness and composition of cement upon plastic flow, (3) plastic flow of concretes in tension and in compression, (4) fiber strains in plain concrete beams under constant sustained bending moment, and (5) stresses developed in large concrete cylinders under complete axial restraint during a heating-cooling cycle similar to that which will occur in mass concrete.

Observations of plain concrete cylinders which have been under various intensities of sustained compressive stress for a period of ten years indicate that the plastic flow is still increasing at a measurable rate. In the extreme case of a sustained stress of 900 lb. per sq. in., the total flow of air-stored specimens for the 10-yr. period has amounted to more than 1.3 in. per 100 ft. The total flow of water-stored specimens is of the order

(Continued on page 85)

Pit and Quarry Special

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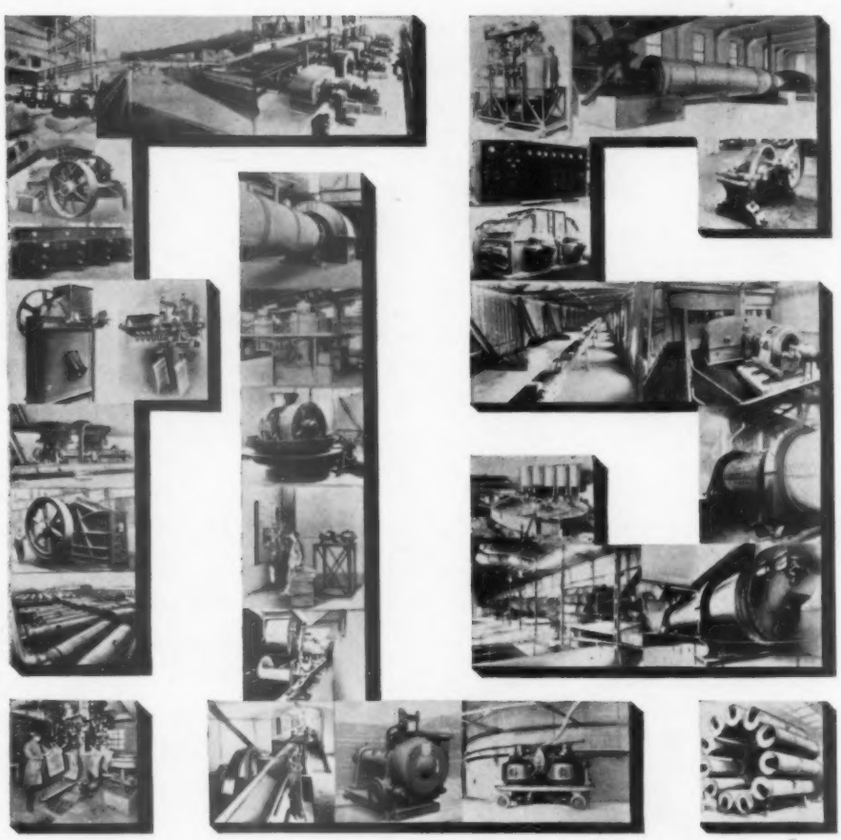

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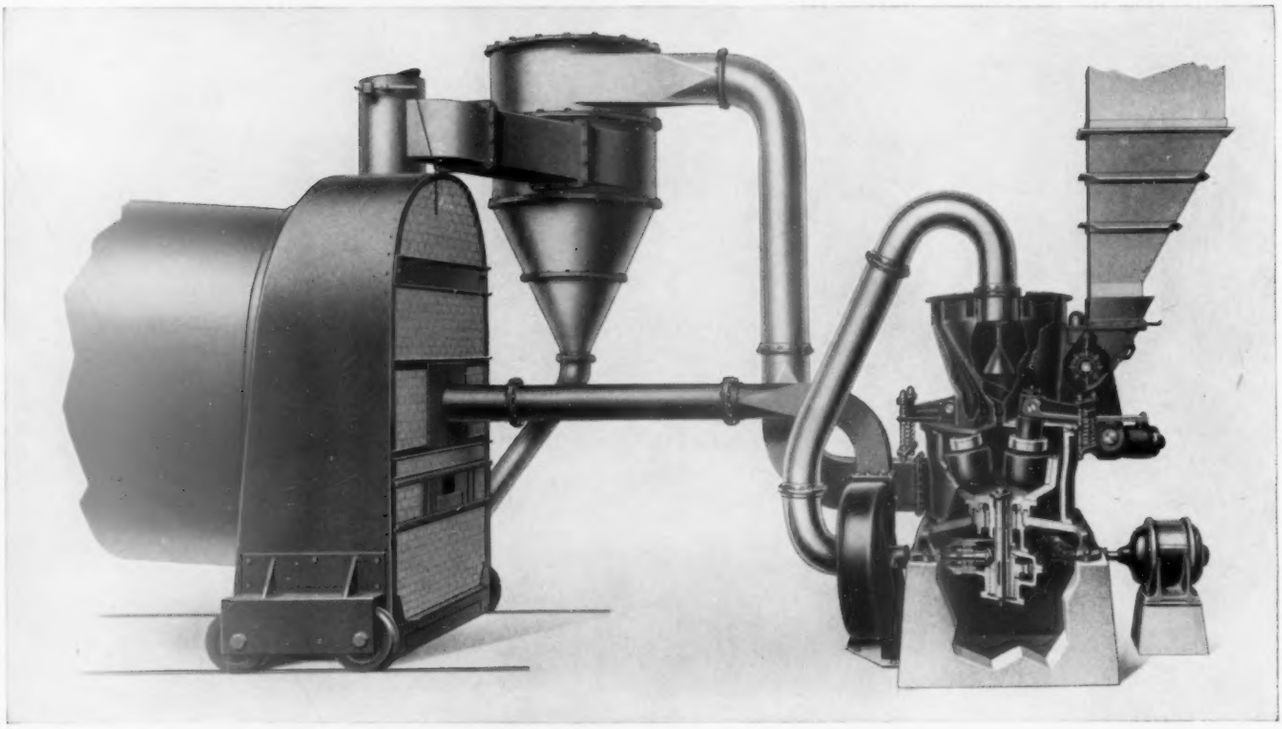

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206 Total Units in TWO YEARS

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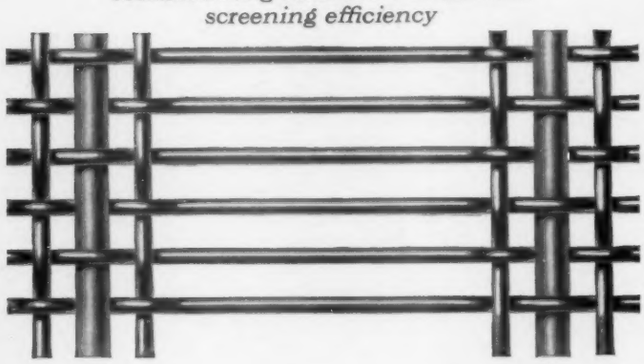

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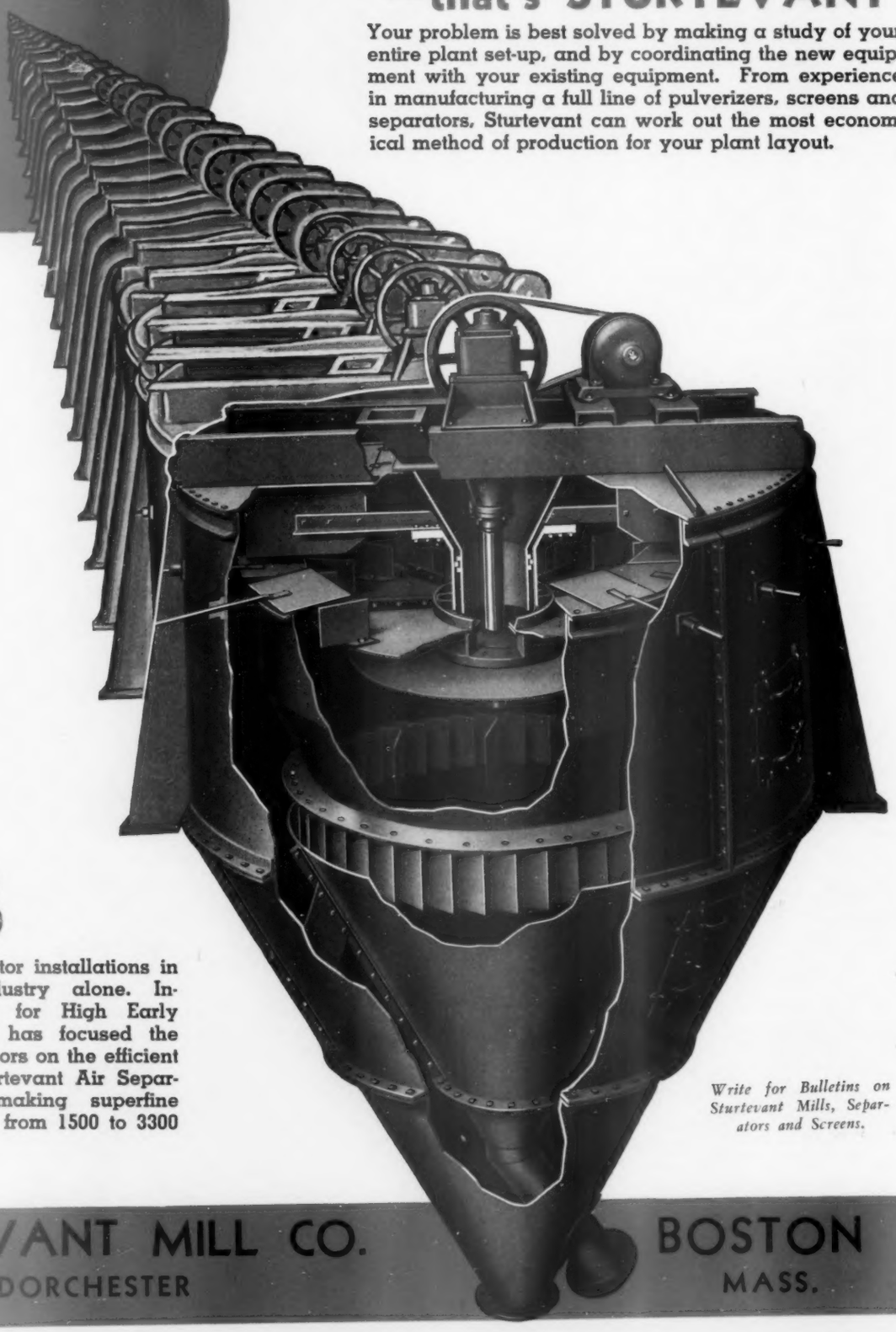

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Part of the operations of Marquette Cement Mfg. Co. at Oglesby, Ill. The No. 2 plant is in left background.

Marquette Completes Part of an Extensive Improvement Program

By W. E. TRAUFFER

THE Marquette Cement Manufacturing Co. has, over a period of many years, acquired a reputation for being a wide-awake, progressive organization always ready to adopt improved methods or equipment in order to make a better product at lower cost. Many methods now accepted as standard practice were regarded skeptically by the industry until proved in this company's plants. This phase of the company's history is well-known to most cement men. Another phase not so well known is the company's policy of long standing to make employment by it as pleasant and safe as possible. The close relationship and understanding between the executives and the workmen in this organization is, to say the least, unusual in a company of this size.

The company during the depression adopted a policy of conducting its operations in such a way as to bring about continuous operation and, consequently, continuous employment for its workers. Instead of running its plants at or near capacity until the storage is filled up and then shutting down, the rate of operation is adjusted to the prospective demand for cement during slack periods. This permits operation during almost the entire year. In order to accomplish this, some of the kilns in each plant are shut down entirely while the others are slowed down and operated at restricted capacity. In the quarries men are taken from the regular operations of producing stone and put on other jobs such as removing overburden, etc. According to W. A. Wecker, president of the company, this desire to provide employment for its regular workers was the reason why the contract stripping arrangements were terminated.

Storage facilities at Oglesby. The silos at right are said to be largest single cement-storage unit in existence and have a capacity of 1,000,000 bbl.

In this article no attempt is made to give a complete description of all of the company's operations, as that would necessitate devoting this entire issue to this subject. Only the improvements made in recent years are described, and the various connected operations are mentioned briefly in order to give the reader a connected story.

According to Mr. Wecker, the company always aims to have before it a schedule of desired improvements which are worked on by the operating and engineering departments and developed by them as time permits. Among the projects under consideration at this time are the following:

1. Cement storage and packing plant terminal at Milwaukee, Wisconsin.
2. Water transportation facilities to transport cement from La Salle to Milwaukee.
3. Water transportation facilities for transporting coal to the La Salle Plant.
4. A dock at the mouth of the Vermillion River on the Illinois River for transferring cement and coal to and from barges.
5. Improvement in the mix-making facilities at both plants in order

Two views of wheeled scraper removing overburden from deposit. Upper view shows angledozer attached.

to bring about absolute hairbreadth control over the composition of the raw mixture and make it possible to vary that composition at will.

6. Diesel tractor and tractor wagon haulage in the quarry at the La Salle plant to reduce the cost of transportation of rock from the quarries to crushing plant.
7. Revamping of all raw and finished grinding departments.
8. New wash- and change-room facilities for the workmen at both plants, the changes to consist of the installation of the most modern equipment for washing, bathing and storing clothes. This development contemplates lockers with forced ventilation.
9. Rearrangement of the office buildings at both plants.
10. Built in vacuum cleaning units in all departments at both plants so as to eliminate all dust incident to sweeping and cleaning up.
11. Extension of pavements and sidewalks around the plant yards.
12. Installation of dust-collecting equipment at all remaining dusty points in both plants.
13. Revamping of the equipment in all of the shops.
14. Decentralization of the production of compressed air.
15. Cement storage and packing plant terminal at Vicksburg, Mississippi.
16. Water transportation facilities to transport cement from Cape Girardeau to Vicksburg.
17. Improved facilities for transporting cement from the plant to the river dock at Cape Girardeau so as to speed up operation at reduced cost.
18. Replacement of old remaining wooden storage bins at Cape Girardeau plant with modern concrete silos.
19. Revamping of the packing and loading departments at both plants.
20. Revamping of the sack-handling departments at both plants.

The company's history dates back to 1891, when two college professors prospecting in the Vermillion River valley south of La Salle, Ill., discovered a deposit of limestone similar to the cement rock in the Lehigh Valley. These professors built a small plant and struggled along until 1895, when three brothers, William, Theodore and John Dickinson bought them out. In 1898 they incorporated as the Marquette Portland Cement Co. and a few years later went into bankruptcy. In 1902 William and Theodore Dickinson found new financial backing and bought the property back at a creditors' sale. The present Marquette Cement Mfg. Co. was then incorporated and has operated this property ever since.

The plant at Cape Girardeau, Mo., was built in 1910 by former Lehigh Valley cement men backed by local capital. This plant and property were acquired by the Marquette Cement Mfg. Co. in 1923.

For many years all the stone for the Oglesby plant was secured by mining because of the heavy overburden, 5 to 120 ft. thick, which could have been removed only at excessive cost. Drifter drills and compressed-air shovels were used in the mine, which was developed by the room-and-pillar method. Electric trolley locomotives hauled the loaded cars to the plant.

By 1922 the mine had been extended to a point where the overburden was lighter and it was decided to open a quarry. Open quarrying proved so satisfactory that mining was gradually eliminated as the quarries were developed and in 1936 the mines were abandoned entirely. The increasing demand for cement before the depression and

Some of the direct-firing coal pulverizers connected to the eight kilns of the No. 1 plant of the Marquette Cement Mfg. Co. at Oglesby.

the erection of Plant No. 2 in 1928 also required far greater quantities of stone than formerly and this factor also worked in favor of open quarrying.

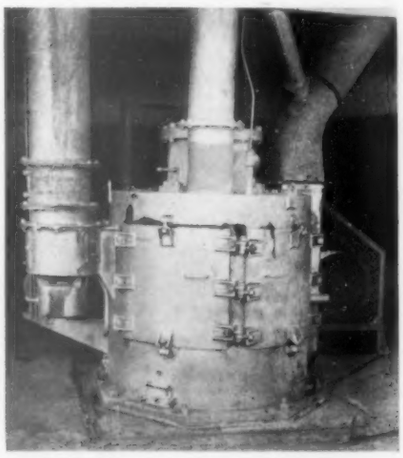
The overburden at the present workings ranges from 10 to 120 ft. in thickness but that over 50 ft. thick is not removed because of the expense. At first the overburden was removed by a 1¼-cu. yd. steam shovel which loaded it into 4-cu. yd. Western dump cars hauled by 7- and 12-ton Whitcomb gasoline locomotives. Later the stripping was done by a contractor and a 4-cu. yd. steam shovel and 18-cu. yd. Western dump cars were used. Enough overburden was removed up to 1933 to last for several years and stripping was then discontinued until March, 1936. At that time the company resumed stripping with the same equipment it formerly used. In December, 1936 the present equipment was purchased.

At the Baileys Falls quarry a 3-cu. yd. Marion electric shovel with a 3½-cu. yd. dipper loads the overburden into three 13-cu. yd. Athey two-way dump trailers which are hauled by three Caterpillar R D 8 Diesel tractors a distance of from 1,300 to 1,500 ft. to a waste fill in a worked-out section of the quarry. One of these tractors is equipped with a bulldozer to enable it to level off to some extent the fill and the road from the shovel to the waste dump. A Caterpillar R D 7 Diesel tractor with a bulldozer is also

The hammer-mill which is used as a secondary crusher.

used for this purpose. These three wagons are carrying loads averaging 8½-cu. yd. solid dirt measure. They are hauling an average of 3,600 cu. yd. in 24 hr. over extremely rough and at times very muddy terrain. According to Frank Moyle, general superintendent of the company's plants, these tractors and crawler wagons are hauling the overburden at about one-sixth the actual operating cost of the former railway method used. These wagons are hauling the material 1,500 ft. at a cost of 5c per cu. yd., not including depreciation, compared to 30 to 32c total cost with locomotives and cars. Mr. Moyle believes that a cost of 8c per cu. yd. to include repairs over a long period of time is a conservative estimate. Even when a figure yet to be determined is added for depreciation the total cost will still be far below that of the former method.

At the Pettigrew quarry conditions are somewhat different as there is a bed of very tough shale in the overburden which can not be removed by ordinary methods. Because of the impracticability of removing this clay with a shovel several other methods were tried. Hydraulicking was tried but even with extremely high nozzle pressure the shale could not be cut. A clay shredder was then tried and the shale cut down was disposed of by hydraulicking. This method also failed

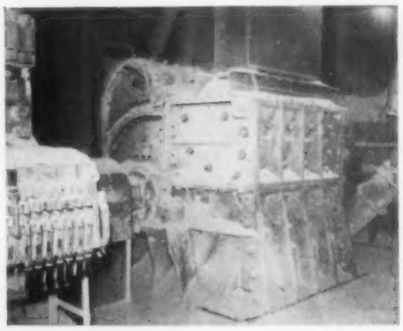


One of the eight direct-firing coal mills in the No. 1 plant at Oglesby.

to work effectively and the shredder is to be tried in the company's clay pit where conditions are not so severe.

At this quarry, which has not yet been fully developed, no space for dumping the overburden is available within 1,600 ft. To reach this point considerable marshy ground must be traversed. Because of these conditions the company recently purchased a 12-cu. yd. Le Tourneau Carryall scraper hauled by a Caterpillar R D 8 Diesel tractor. This scraper is equipped with large pneumatic tires which enable it to carry a full load regardless of ground conditions. The tractor is also equipped with a Le Tourneau Angledozer which on each trip levels off the material dumped on the preceding trip. This equipment also lays its own road over marshy ground. According to Mr. Moyle, the results are highly satisfactory and this scraper is moving about 80-cu. yd. of overburden per hr. on a one-way haul of 1,600 ft. The use of this scraper also eliminated the necessity of purchasing a shovel for removing this material.

A third quarry, known as the Peninsular, was stripped by contract several years ago and will not require further removal of overburden for some time to come. Both the clay and the stone are obtained here within a few hundred feet of each other. The clay is excavated by a Link-Belt 1-cu. yd. gasoline shovel, and the rock is loaded



One of the two hammer-mills preceding the raw-material driers.

by a Marion Model 120 compressed-air shovel with a 1¼-cu. yd. dipper which will be abandoned when the quarry is finally depleted. The 4-cu. yd. Western cars loaded with clay and rock are hauled a distance of about 2,000 ft. by two 7-ton and a 12-ton Whitcomb gasoline locomotives to the main line leading to the plant. A 15-ton Jeffrey electric trolley locomotive hauls these cars the remaining 600 ft. to the plant.

At the Baileys Falls quarry a Marion Model 4120 electric locomotive with a 3-cu. yd. dipper loads the stone into 4-cu. yd. Western cars. Several 14-ton Whitcomb gasoline locomotives haul these cars a distance of about 1,400 ft. to the mine entrance. Two Jeffrey electric trolley locomotives, one rated at 20 tons and the other at 15 tons, haul the cars a distance of 4,000 ft. through the abandoned mine and to the plant.

At the Pettigrew quarry a Bucyrus 100B electric shovel with a 3-cu. yd. dipper loads the cars, which are hauled a distance of about 500 ft. to another mine entrance by a 12-ton Whitcomb gasoline locomotive. Two 15-ton Jeffrey electric trolley locomotives haul these cars a distance of 7,000 ft. through the mine to the plant.

The ledge of stone at all the quarries is from 25 to 30 ft. thick. Drill-

Manifolds and kiln hoods used in connection with grate-type coolers.

ing is being done with Gardner-Denver wagon drills, most of which are the drifter drills formerly used in the mine and are mounted on derricks. Hollow drill steel 1⅛ in. in diameter with four sizes of forged bits are used. These range up to 2¼ in. in diameter at the bottom of the hole. Holes are fired in single rows with 7-ft. by 8-ft. spacing. Electric blasting caps and DuPont 40-per cent. ammonia explosive are used.

All the quarries and both the crushing plants are operated on a 6-hr. shift from 7:00 o'clock to 1:00 o'clock. The cars are hauled a distance of 2,500 ft. by two 14-ton Whitcomb gasoline locomotives over a new line which has been opened from the Pettigrew quarry to the mine opening at the Bailey Falls quarry. From this point electric locomotives haul the stone 4,000 ft. through the mine to the plant. This route was made possible by the construction in 1932 of a bridge over the Vermillion River which cut 6,000 ft. off the haul from the Bailey Falls quarry to the plant.

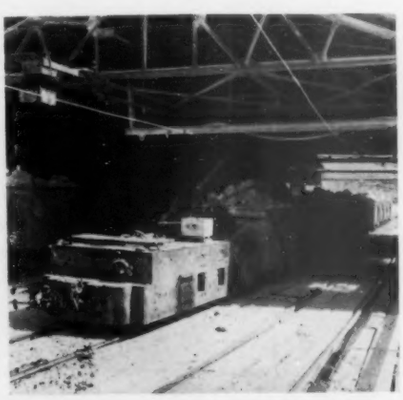
The cars being hauled from these quarries are taken over another bridge which connects the mines to the plant. This bridge and a trestle extending from it to the crushing plants are used for the storage of loaded cars. Rotary car dumpers discharge the contents of the cars into the plant primary crushers.

In the No. 1 crushing plant the 48-in. by 60-in. Allis-Chalmers primary jaw crusher product is fed by a Link-Belt inclined bucket-conveyor to the two Allis-Chalmers No. 8 secondary gyratory crushers. Another bucket-conveyor feeds the product of these crushers to a 42-in. belt-conveyor which discharges it by means of a traveling tripper into eight concrete storage silos with a combined capacity of 20,000 tons. These silos were built in 1929 and replaced the original wooden bins.

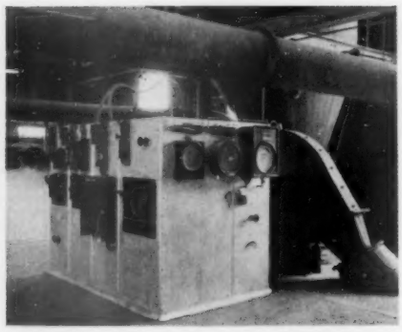
One of the raw-grinding mills with separator in closed-circuit.

The No. 2 crushing plant was built in 1929 as part of the No. 2 cement plant. A pan-feeder discharges the stone into the Traylor 48-in. by 60-in. primary jaw crusher from which an inclined bucket conveyor takes the stone to the secondary crusher, a Pennsylvania hammer-mill. The product of this machine is discharged into an inclined bucket-conveyor which dumps it on the first of a series of 36-in. belt conveyors. These discharge the stone on the 42-in. storage conveyor already described. Stone is reclaimed from the storage silos by belt-conveyors which feed the raw-material grinding department. A Merrick Weightometer weighs the stone passing over one of the conveyors in this series.

The stone and clay are proportioned under the storage silos by reciprocating feeders. This raw material is then split to two Gruendler hammer-mills whose product goes to three rotary driers. Raw grinding is done in five Traylor 8-ft. by 7-ft. by 47-ft. 3-compartment mills and a Traylor 8-ft. by



One of the electric trolley locomotives which haul rock to plant.



Control board for kiln and cooler with fan in background.

33-ft. mill. Each of these six mills was originally connected in closed-circuit with an 18-ft. Raymond mechanical separator. It has been found that better results are obtained with a higher circulating load than was possible with this system, so each one of two of the large mills is being operated in connection with two of the separators. Under this arrangement these two mills are usually able to keep up with the plant demand but are sometimes supplemented by one or both of the large mills operated with one separator each.

A Fuller-Kinyon automatic blending system distributes the pulverized raw material into three silos with a combined capacity of 7,500 tons.

The burning is done in eight 8-ft. by 9-ft. by 100-ft. Vulcan rotary kilns which operate in connection with Lee coolers and Babcock & Wilcox direct-firing coal mills. A Lee cooler was installed on one of these kilns in November, 1931 and proved so successful that seven additional coolers were installed in this plant and three in the Cape Girardeau plant early in 1932. An article by Frank Moyle giving a complete description of these coolers and the results obtained with them was published in the January, 1934 issue of PIT AND QUARRY. The first direct-firing coal mill was installed in 1934 and the other seven mills early in 1936.

The Lee coolers reduced the kiln fuel consumption about 15 per cent. below the former average of 1,600,000 B.t.u. per bbl. The coal mills, when later installed, effected a further saving of 20 lb. of coal per bbl. These figures do not include the savings in the elimination of the drying and handling of the coal necessary with the former bin system, the better combustion inherent in the better mix of coal and air obtained with these mills, and other economies. Shortly after this equipment went into operation the

Stripping at Baileys Falls quarry with 3½-cu. yd. shovel loading a 13-cu. yd. two-way dump trailer.

company began to manufacture modified and high-early-strength cement. For this reason any improvement in burning efficiency which would naturally be expected after the usual early operating adjustments are made can not be estimated. Mr. Moyle states that the continuity of operation with these mills is at least as good as with the former bin system and that coal is being ground at about one-third the former cost. His records show that the grinding elements have an average life of 6,000 hr. of operation. After that period the grinding balls are replaced and the grinding ring is built up and reground.

The clinker is conveyed from these coolers over another Merrick Weightometer to storage tanks from which it is proportioned with the gypsum to five Bradley Hercules mills. The product of these mills is fed to twelve Allis-Chalmers 5-ft. by 22-ft. tube-mills each one of which is loaded with 22 tons of steel and chilled-iron balls. The original storage silos had a capacity of 400,000 bbl. and these were supplemented in 1928 with twenty 50-ft. by 100-ft. silos with a combined capacity of 1,000,000 bbl. These silos were erected by the MacDonald Engineering Co.

The improvements made to the Cape Girardeau plant in recent years make an impressive list. This program may be said to have begun in 1931, when the evaporating system for the power-plant was installed. In 1932 all three kilns were equipped with Lee coolers and the truck and skip haulage system was installed in the quarry. In 1936 four Babcock & Wilcox di-

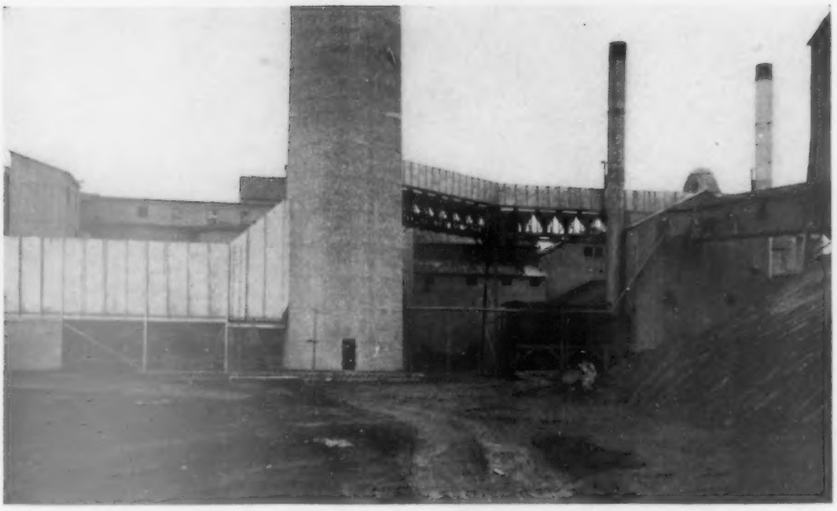
The 3-cu. yd. electric shovel loading cars in Pettigrew quarry.

rect-firing coal mills were added, one for each of the three kilns and one for the rotary driers. The commercial stone plant was rebuilt and new screens installed in 1935 and an Allis-Chalmers dust-collector was added in the pack-house. The washing plant was built and the new kiln stack and flues were erected in 1936. Two new Traylor clinker crushers and another dust-collector have just been installed in the finish-grinding department. Work will soon begin on the installation of a Cottrell precipitator to cleanse gas from the waste-heat boilers. Many other improvements are planned.

Stripping of the quarry at Cape Girardeau was completed about seven years ago and was done hydraulically. The material was pumped to some low land about 1.5 mi. from the stripping site. Primary drilling consists of 8-in. blast holes drilled back 19-ft. from the face and spaced 20-ft. apart. One Armstrong and three Sanderson Cyclone drills are used. Eight-inch 350-lb. bits and 5-in. by 20-ft. drill stems are used. Several years ago 6-in. holes spaced 14 by 15 ft. were used but the present 8-in. hole proved much more economical. The company uses Cordeau-Bickford fuse and 60 per cent. gelatine dynamite. Block holes are drilled by Ingersoll-Rand and Gardner-Denver jack-hammers, and 30-per cent. quarry gelatine is used. A new shop and a modern washroom for quarry employees were completed this year.

Hauling methods at the Cape Girardeau quarry have been changed several times in recent years. For many years locomotives and cars were used in the quarry, but these were abandoned early in 1932 in favor of truck haulage. At that time five 15-ton

Special self-unloading bulk-cement car being loaded from screw-conveyor and spout at Cape Girardeau pack-house.



The base of the new 350-ft. concrete kiln stack with flue from waste-heat boilers at left and flue from driers at right.

Sterling trucks with 10-cu. yd. Easton end-dump bodies were purchased. These trucks are 6-cyl. units with two driven rear axles and have 12 speeds forward and 6 reverse. All these trucks were originally fitted with solid-rubber tires, but one of them has since been equipped with pneumatic tires. Skip cars were ordered at the same time to haul the stone from the quarry level to the plant.

These trucks temporarily hauled the stone from the quarry up an incline 440-ft. long to the primary crusher, which is on a level 55 ft. above the quarry floor. This method was used for 60 days while the skip incline was being built and proved uneconomical because of the time required to climb such a long and steep grade (12 per cent.). The double incline with two Easton 12-cu. yd. skip cars operated by an Ottumwa Iron Works hoist was originally installed to carry the stone from the quarry level to the plant. The lower end of this incline was in a pit which made it possible to lower the skip cars to a point from which they could be loaded direct from the trucks on the quarry level.

Since then quarrying operations have been transferred from the lower level to one 97 ft. below the crusher. The only change necessary in adapting this system to the new operating conditions was the construction of a trestle over the incline at this level so that the trucks can discharge their loads into the skip cars from either side. Stone is loaded into the trucks by two 1¾ cu. yd. Marion Model 37 and one 3-cu. yd. Marion Model 70 shovels, all electric.

It has been found economical to maintain a clean and smooth roadbed for these trucks because of longer tire life. This work is done by a Caterpillar 30 tractor equipped with a bulldozer.

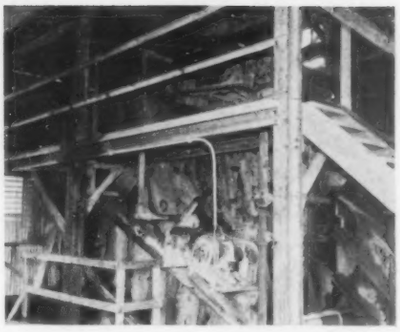
According to E. M. Gould, quarry superintendent, the haulage cost alone is about the same with trucks as with locomotives and cars but, due to the flexibility of truck haulage, the larger bodies used on the trucks, and the

View from present quarry face showing incline to crushing plant with two levels of discharge. Conveyor system and commercial crushed stone plant are visible in background.

The commercial crushed-stone plant with feed and return conveyors. At left are conveyors from main crushing plant and to cement-mill storage.

elimination of delays due to crossing and moving tracks, two shovels now load more stone than three formerly did when cars were used. Elimination of these delays has also made it possible to keep a larger and more constant flow of material through the plant with a resultant satisfactory saving.

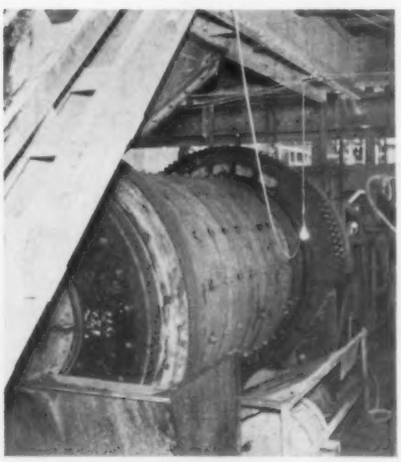
Stone is discharged from these skip cars into a hopper from which a pan conveyor feeds it into the 48-in. by 60-in. Traylor primary jaw crusher set at a 5-in. opening. An inclined bucket-elevator discharges the crusher product into a McLanahan & Stone 7-ft. by 18-ft. blade mill where water is introduced. The blade mill is equipped with



The two 4-ft. by 16-ft. 3-deck screens in the commercial stone plant.

heavy liners and blades pitched to advance the material. It carries from 12 to 15 tons of material and this load supplies its own breaking or scrubbing action. This machine was installed last year to produce a cleaner stone for commercial demands and to give better control of the clay content in the cement rock. The washed stone is discharged on a 5-ft. by 11-ft. Allis-Chalmers 2-deck vibrating screen where sprays further clean the stone as it is dewatered. The undersize (⅜-in. minus) material coming from this screen is discharged into an Allis-Chalmers double-screw sand washer whose dewatered product is discharged into a bucket-elevator. The stone retained on the top deck of the screen is split to two Williams No. 7 Jumbo hammermills or to a No. 8 Allis-Chalmers gyratory crusher whose product and the intermediate size of stone from the screen are discharged into the elevator mentioned above. Each bucket on this elevator is divided into two parts so the elevator can handle both classes of material at one time.

The bucket-elevator discharges the stone on two belt-conveyors 200 ft. long which end at a transfer house. One conveyor is 20-in. and the other



The 7-ft. by 18-ft. blade mill in the stone-washing plant.

30-in. wide. At this point the stone is discharged from the 30-in. belt on a 30-in. by 600-ft. belt conveyor which dumps it into a 30,000 ton storage pile at the cement plant. A Merrick Weightometer on one of these belts weighs the cement rock. This stone is reclaimed from storage by a tunnel belt-conveyor. Stone for the commercial crushed-stone plant is discharged from the 20-in. belt on a 28-

Electric shovel loading stone into one of the 12-cu. yd. quarry trucks.

Truck discharging its load into one of the 12-cu. yd. skip cars.

in. by 250-ft. belt-conveyor which dumps it on a 4-ft. by 16-ft. Allis-Chalmers triple-deck vibrating screen. Directly under this screen is another like it. The oversize material can be reduced in a Symons 4-ft. cone crusher and returned by a bucket-elevator and conveyor for loading into cars or trucks. These screens are also equipped to rinse the stone. A small Niagara vibrating screen can be used for further fine screening. Stone can also be dumped from these bins on a belt-conveyor which discharges it at the transfer station on the belt running to the cement plant.

Stone can also be stock-piled at the commercial stone plant and rehandled by Ohio steam locomotive cranes into a bin, from which it is elevated back into the plant for recrushing and screening. Because of the extensive use of water, both stone plants are free

Screw-conveyors which carry dust from one of the dust-collectors.

from dust at all times. A recent addition to the plant equipment is an American Hoist and Derrick Co. 25-ton locomotive crane with a Hercules 100-hp. Diesel engine.

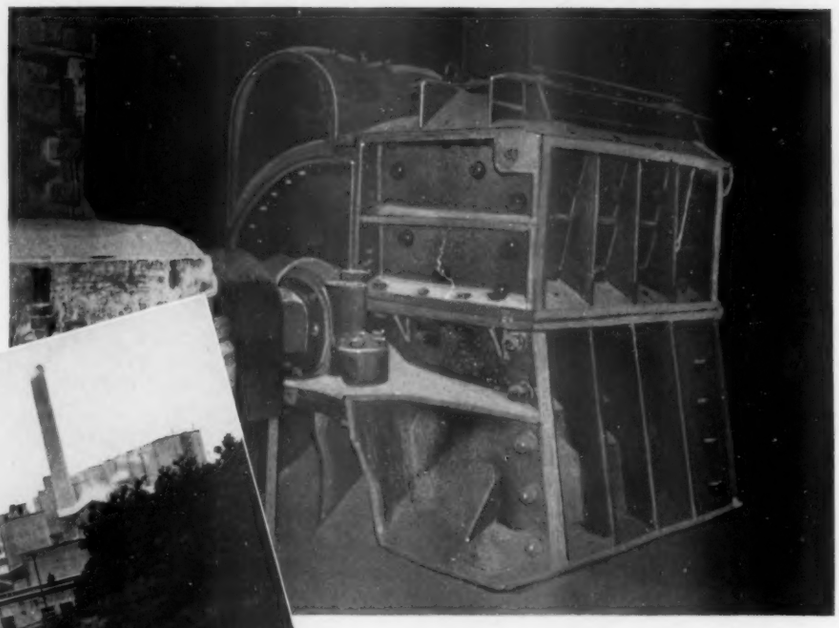
An unusual system of hoppers and spouts makes it possible for these two triple-deck screens to grade efficiently 300 tons of primary load per hour together with a secondary crushing load which brings the total load on the screens up to 450 tons per hour at times.

Stone is reclaimed from the cement plant stock-pile by a tunnel belt-conveyor. It is then passed through a coal-fired Vulcan rotary drier and two ball-mills into bins. Clay is brought in cars from a pit 3 miles distant and is passed through a pug-mill and another rotary drier before being sent to bins. Two Richardson scales under these bins proportion the stone and clay. The raw mix is fed into an Allis-Chalmers 3-compartment mill. In this department there are also 16 Fuller 42-in. mills of which only three or four are usually needed to supplement the compartment mill. The mill product is fed to 16-ft. and 18-ft. Allis-Chalmers mechanical separators from which

The two new gyratory crushers preceding the clinker-grinding mills.

GRUENDLER at Marquette

doing a great job of combination crushing



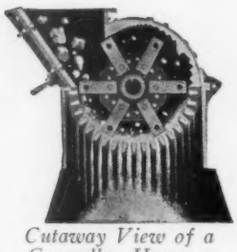
Above: Installation of Gruendler Hammermills at Oglesby, Illinois, plant of Marquette Portland Cement Company.

At Left: General View of plant.

TWO Gruendler Hammermills handle all of the raw material going into the Oglesby plant of the Marquette Portland Cement Company—and they are doing a difficult job with amazing efficiency.

They take the proportioned feed of clay and stone, and reduce it to suitable size for the rotary dryers to prepare for the raw grinding in the tube mills. This is a real problem in crushing as the materials are so dissimilar — one, a wet sticky clay, and the other, a hard limestone.

It is significant that these Hammermills were retained in the extensive modernization program recently completed—as Marquette found by experience that the Gruendler units were the only type of crushers capable of giving the proper reduction of the two materials to insure efficient operation of the dryers.



Cutaway View of a Gruendler Hammer Crusher.

GRUENDLER CRUSHER & PULVERIZER CO.

Established 1885 ∴ St. Louis, Missouri

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HAMMERMILLS • CRUSHERS
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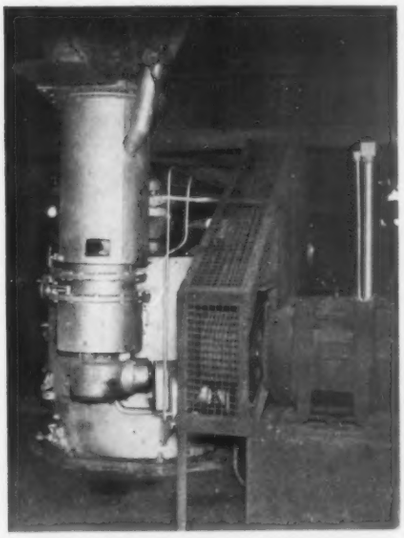
BELT AND CHAIN ELEVATORS • ROTARY DRYERS
PORTABLE, SEMI-PORTABLE, STATIONARY UNIT PLANTS

the fines are discharged into a 10-in. Fuller-Kinyon pump that is part of a raw-blending system with three 2,600-bbl. silos.

The blended raw material is withdrawn from the silos by screw-conveyors and is transferred into three 1,500-bbl. kiln-feed bins. The three 130-ft. kilns have Lee Process clinker

Bulk cement being discharged from special car to pump which loads barges.

coolers which have cut down the fuel consumption considerably. With these coolers it has been possible to increase the cement fineness from 92 to 95 per cent. through 200-mesh without lowering the grinding capacity. An endless pan-conveyor with a Merrick Weightometer distributes the clinker into six 1,500-bbl. steel bins. The



One of the four direct-firing coal mills in the Cape Girardeau plant.

same conveyor later transfers it into a 6,000-bbl. steel bin. Gypsum is stored in an adjoining bin. A Richardson Convey-o-Weigh proportions the clinker and gypsum on a series of conveyors and elevators feeding a Niagara vibrating screen. The clinker retained on this screen is discharged into two new Traylor Type TY gyratory crushers. The crusher product, together with the fine material from the screen is conveyed to the finish-grinding department. The equipment here consists of five 40-in. Bradley Griffin mills feeding three 6-ft. by 16-ft. Bonnot tube-mills. These are supplemented by three two-compartment mills, two Traylor 7-ft. by 26-ft. mills and an Allis-Chalmers 7-ft. by 22-ft. mill. Four Sturtevant 14-ft. separators are operated in closed-circuit, one with

View of the Cape Girardeau plant of the Marquette Cement Mfg. Co. from the docks on the Mississippi River.

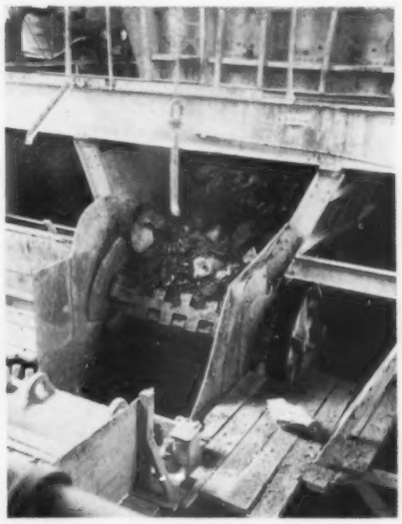
The vibrating screen which receives discharge from blade mill. Sand-dewatering screw at left.

each of the three compartment mills and one with the three tube-mills.

The fine product of the separators, cement, is carried by screw-conveyors and elevators to the storage system, which has a total capacity of 298,000 bbl. There are sixteen 25-ft. by 85-ft. concrete silos and six other silos 50-ft. by 56-ft. The two pack-houses together have 6 Bates baggers and two Bates automatic tiers.

The Babcock & Wilcox direct-firing coal pulverizers on the three-rotary kilns have lowered the cost of coal preparation about 2c. per bbl. of cement produced. The fuel saving amounts to 10 lb. per bbl. or an additional cent per bbl.

Cement can be shipped from these pack-houses in sacks and in bulk by rail. A barge terminal on the Mississippi River, about 3,000 ft. from the plant, is also used for bulk and bagged cement shipments. Bagged cement is transferred from cars to ten flat-deck



Pan-feeder discharging stone from hopper into primary jaw crusher.

barges operated by the company. Bulk cement is loaded at the plant into special hopper cars which unload at the dock by means of screw-conveyors. A Fuller-Kinyon pump at the terminal transfers the cement into self-unloading steel barges. The company has

(Continued on page 61)

One of the two hammer-mills used for recrushing stone.

Building a faster drill is one thing—

Making it so that it will stand up is another

That's why Ingersoll-Rand pistons pass through 48 operations in their manufacture

These numbers on a piston enable us to determine the exact batch of steel from which it was made, as well as all of the pertinent details concerning the forging, machining, heat-treating, inspection and test of the part.

PIECE by piece the parts of a rock drill look simple and easy to make—but looks are deceiving. No other machine has to withstand the abuse of modern drills.

Consider the piston of the DA-35 drifter; one end operates at a freezing temperature, the other, frequently at 250° F. It must deliver heavy blows at the rate of about 2000 per minute (depending on conditions)—millions of these impacts during its lifetime. It receives 48 separate machining, testing and heat treating operations and is actually being worked on 55 hours in the course of its manufacture.

During the last thirty years there has been a tenfold increase in drilling speed—the life span of parts has been lengthened—dependability has grown progressively greater—upkeep costs have steadily decreased. Credit for this great improvement is due in a large measure to Ingersoll-Rand research and development.

REASONS WHY THE DA-35 PISTON STANDS-UP

1. Metallurgical specifications for each piston incorporate 60 years of accumulated experience.
2. No steel for any other purpose whatever, is selected as carefully as the material that goes in rock drill pistons. Composition is controlled with unbelievable accuracy. Each batch must pass a physical inspection, chemical analysis and an elaborate hardenability test before it leaves the mill.
3. Proper heat-treating is a highly technical operation. The handling of this step in the manufacture of I-R drills is entrusted only to specially trained metallurgists.
4. A correct design, highly skilled craftsmen and a thoroughly modern plant and equipment insure a superior product. Sizes are held to one-half of one-thousandth of an inch (.0005") variation.
5. Every finished piston is tested in a specially developed magnetic testing machine, which gives what we call "a mechanical X-ray", indicating the depth of hardness and the most minute variations from specified standards. Each lot of finished pistons is also given an actual running test on Barre granite.

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			Vacuum Pumps

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Closed-Circuit Grinding With Air Separaters

By J. S. VRABEK

Vice-President & Sales Manager
Sturtevant Mill Co.

RAPIDLY-RISING cement shipments have fully demonstrated the wisdom of those manufacturers who, in anticipation of just such a decided upward trend in sales, inaugurated large improvement programs designed to better the efficiency, lower the production cost, or widen the product-variety of their plants. Other manufacturers, a little more cautious and, perhaps, not so much in need of physical betterments in their facilities, have seen in the rising curve of cement shipments the incentive to make the changes which they had been contemplating. As a result the physical plant of the cement industry is undergoing a remarkable renovation, a renovation made necessary in some cases by the growing demand for high-early-strength and other special cements, in others by the pressing need for lower production costs to meet those existing in more efficient competitive mills, and in still others by the rapid encroachments of obsolescence.

From the inception of the cement industry until a few years ago it was at first customary, and later compulsory, to express fineness of cement in terms of sieve residue. This requirement is still in force, even though it is practically without intelligible meaning.

It is an established fact that the properties produced in cement by pulverizing bear no direct relationship to the percentage weight of the cement which passes a given critical mesh size. Instead, these properties are directly related to the surface area of the cement, which is an expression of the fineness of the material which has passed through the sieve, and the true state of subdivision can only be ascertained by an analysis of this material which has passed through the finest practical sieve.

In recent years Mr. Wagner, after considerable research, established the fact that there is a logarithmic relationship between the fineness (surface area) of cement and the intensity of light transmitted through a suspension of the cement being measured. Results can just as easily be expressed in square inches per pound or in any other unit suitable for expressing the relationship between surface area and unit weight.

Modern theory suggests that the first step in the mechanism of cementing action is the wetting of each grain's surface, followed by a series of chemical reactions which take place at the surface of each grain, with the formation of new complex compounds which have the power of hardening and cementing together all the materials in the mass. The origin of the reaction is at the grain surface and progresses steadily inward from the surface to the center of the grain as long as water is available for continued reaction until eventually the whole of each grain has reacted with water to form new complex compounds.

Obviously, it follows that the finer the state of subdivision or, in other words, the smaller the cement grain, the more rapidly and completely will reaction take place for any given set of conditions and the more profound will be the effect of this state of subdivision upon the technical properties of cement; thus, some measure of the cement grain's surface becomes necessary if the effective fineness and its relationship to the technical properties of cement are to be determined.

The practical development of the air analyzer has made it possible to secure a close knowledge of finenesses below the 325-mesh and to determine the effect on the quality of the product of variations in these finenesses. The accurate determination of micron size adds greatly to our knowledge of fine grinding and has eliminated guess work in this field of essential importance. This knowledge of micron sizes is equally important in the grinding of raw materials and of clinker.

Principles of Grinding in the Cement Industry.—Few industries have undergone more numerous or drastic changes in the methods or equipment used than the cement industry and even to-day the grinding process, although it performs a most important function, can hardly be termed standardized. Tube-mills, however, predominate, either of the unit or compartment type, the latter seldom requiring a preliminary grinder. When required, particularly on raw material, several types of preliminary grinders are utilized for the first reduction, followed by a tube-mill or other type of finisher. With the advent of closed-circuit methods for both raw material and clinker came the utilization of separators (screen and air) for greatly increased capacities, more uniform and finer outputs, to gain the advantages of high early strengths. It focused the attention of the chemical department on changes of the raw-material mix plus the necessity for further studies in terms of the effect of particle-size control to the kilns; the intensity of harder burn and the ability of carrying a high lime ratio; all of which are steps in the direction of the ability to grind finer on the clinker side and in many cases to obtain high early strengths in a cement by increasing the percentage of fines between a given range of microns rather than by increasing the fineness of the "impalpable powder" beyond a certain micron limit that has little if any effect on the final product.

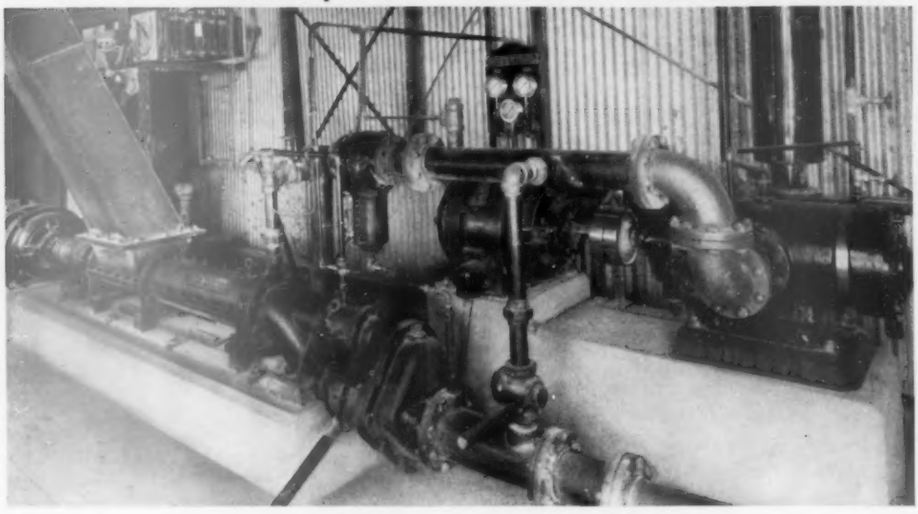
The application of closed-circuit grinding resolves itself into strictly an engineering proposition involving specific knowledge of the cement-manufacturing process from both a chemical and a physical standpoint. It necessitates a practical operating experience with the various types and makes of tube-mills as well as all preliminary machinery; for, to accomplish the purpose successfully, a perfect balance must be reached and maintained between all the equipment within the closed-circuit cycle.

The amount of feed, the circulating load, the percentage of fines in the product (and in the separator tailings returned) of each contributing machine, the ball load and sizes of grinding media in the tube-mills, the grids in division heads, and the screens in the pulverizers, all have to be predetermined to gage accurately the results to be expected. For super-strength cement even the heat of grinding must be controlled.

Few engineers have had the unusual opportunity of operating and observing

A NEW CONVEYING ECONOMY

b.h.p. limited to actual load



Fuller Rotary Single-Stage Compressor supplying air to a Fuller-Kinyon cement pump. Note the compact layout and small space required for this installation

FULLER-KINYON PUMPS AND FULLER ROTARY COMPRESSORS

WHEN conveying cement and other dry pulverized materials, the power required should be controlled by two factors only . . . quantity of material and conveying distance. Both of these are usually variable.

This ideal has not been reached in conventional practice because of limitations in air supply conditions. In an installation of the type illustrated, this has been accomplished because the compressor power input does not exceed the requirements of the actual load conditions at any time.

Expressed in another way, in this new arrangement the compressor discharge pressure, and consequently its b.h.p., varies in direct proportion to the variations in the conveying load. With this simplified control the b.h.p. of the pump motor is also correspondingly reduced and closely follows the variation in load.

Minimum space requirements of Fuller Rotary Compressors permit installation where space is too limited for other types of machines . . . "spotted" at the point of use.

Advantages in addition to the foregoing are:— a compressor to satisfy separate demands for volumes and pressures . . . no excessive idling time . . . no necessity to operate a large machine at low efficiencies . . . no main supply pressure reductions for low pressure uses . . . line losses negligible, there are no long transmission lines.

Records of performance have proved their reliability in long, continuous service under the most adverse installation conditions.

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all this equipment in more than a hundred cement plants and in fully an equal number of other industries using similar machinery for similar purpose. The experience of fine grinding in feldspar, silica, quartz, flint, slag, limestone, phosphate rock, etc. adds greatly to operating knowledge. Every new problem is an incentive to create, to achieve reputation, to win new laurels. Intelligent curiosity probes into every part of the operation or process; the information obtained together with experience in hundreds of similar situations combine, and from this combination come ideas and plans which are likely to be better than any preceding.

There are few industries using pulverizers that can not benefit by the closed-circuit method of grinding. It is old in some industries and a new and untried process in others, yet the principle involved is equally sound whether wet or dry reduction is practiced or whether the business be metal mining or cement manufacture, whether the product be coarse or fine, metallic or nonmetallic. There are those who do not understand the process or the principle involved in closed-circuit grinding, there are others who do not appreciate all its advantages, and there are still others who know about it and are using it to full advantage and to their great profit. It is of sufficient importance to warrant digging deep into the subject by those who are not thoroughly conversant with its almost unlimited possibilities.

Open-Circuit Grinding.—To show the difference between open- and closed-circuit grinding it is first necessary to describe briefly the old process of open-circuit grinding, which has been the standard practice for generations. Open-circuit grinding, sometimes known as one-passage grinding, requires the pulverizer to finish all the material fed to it in one passage through. This is the principle used in the old millstones, tube-mills, roller- and ball-mills, whether using internal screens or not. All these mills are required not only to grind but also to size within the mill, discharging only when the material is reduced to the finished state.

Such a method necessitates that the pulverizer grind to a finish the entire amount fed to it, therefore the amount fed must exactly equal the amount discharged, for otherwise, if fed too fast, the product would be too coarse and the mill would become "plugged". If underfed, the output would be finer than necessary (overground). Under such circumstances, when estimating the feed rate, one must take into consideration the physical characteristics of the material being ground, its size, hardness, toughness, moisture content, etc., for if any of these vary, so will the capacity and the fineness of the output vary.

If a tube-mill is fed with material 90 per cent. of which will pass a 100-mesh screen and 10 per cent. of it a 4-mesh, and if the product desired be 100-mesh, then the feed must be adjusted so that the 10 per cent. of 4-mesh particles will be ground to 100-mesh before any material is allowed to be discharged. That proportion which is already fine enough can not readily escape until the 10 per cent. of 4-mesh is ground to a like fineness.

It is obvious from this example that more than 90 per cent. of the grinding ability of the mill is penalized, for that same 90 per cent. of fines is a direct hindrance to the effective action of the pebbles or balls which are cushioned, coated and obstructed by these confined fines that can not escape. This inefficiency is reflected in curtailed output, in excessive wear, power consumption, investment and the floor space occupied by several mills whose work could be duplicated by one efficiently-operated mill.

As mentioned above, it is necessary in open-circuit grinding that the feed rate and the discharge rate be exactly equal; if not, then any inequality in the material fed is immediately reflected in the fineness of the discharge. If the physical characteristics of the material fed vary in the slightest degree, the feed rate must be instantaneously changed to counteract this condition or the quality of the output will vary accordingly. The only method of correction of the variables is to make constant screen analyses of the discharged product and to modify, by regulation, the feed rate. These all take time and labor so that quick corrections are not practical and usually result in the operator's underfeeding the mill to be sure of his fineness, with the result that the output is penalized and the material is ground finer than necessary—a direct charge against the cost of production.

There are many other factors unfavorable to open-circuit grinding but the above seem sufficient to convince the most skeptical that this method is not efficient—in fact it is grossly inefficient—and if there is a better method, it should claim the serious attention of every intelligent operator of pulverizing equipment.

Closed-Circuit Grinding with a Separator.—There is a better method—one proved beyond the shadow of a doubt, both in theory and in practice, to be far superior to the old and now

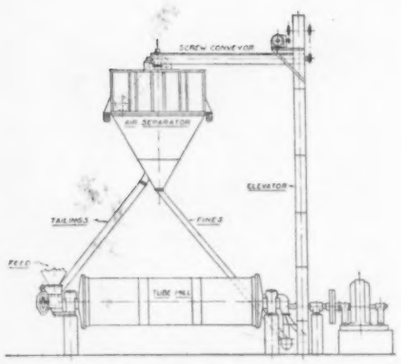

Fig. 1. Closed-circuit unit with tube-mill and air-separator.

obsolete practice of open-circuit reduction.

Closed-circuit grinding may be defined as that method of reduction in which the pulverizer is operated in closed-circuit in connection with a classifier (wet, dry, air or screen), in which case the mill is not required to finish to the desired fineness, in one passage through, all the material fed to it (Fig. 1). The responsibility for sizing rests entirely with the classifier; the only duty of the mill is that of pulverizing. The total discharge from the mill (coarse and fine) passes through the classifier, which selects that portion that is of the required fineness, rejecting and returning to the mill that which is not fine enough, with the fresh feed, for further reduction. That portion of the mill discharge which is not sufficiently ground and is thus rejected by the classifier and returned to the mill for regrinding is termed the "circulating load". That is a definition we should remember.

Under the old open-circuit method wherein the mill was required to finish the exact amount fed to it, the feed rate was precisely limited to the ability of the mill to grind the hardest, or largest, or toughest, or dampest particles. Under the modern closed-circuit method the full ability of the mill is used to grind and grind only; it need not finish (once through) 100 per cent. of its feed. The circulating load may be—and it is most desirable that it should be—built up to an amount equal to several times that of the open-circuit feed, or until a screen analysis of its discharge shows but 80, 70, 60 or even 50 per cent. of the desired fineness.

This means that if by open-circuit methods the feed and the discharge rate is 5 tons per hr. of finished product, by closed-circuit methods this feed rate, including the circulating load, may be increased many times. For instance if it were doubled (10 tons per hr.) and the mill ground only 80 per cent. of the material passing

Cottrell Precipitator handling phosphate rock dust at the plant of British Phosphate Commissioners, Ocean Island, Australasia.

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W. P. C.

COTTRELL PRECIPITATORS

FOR BIG, HARD JOBS ANYWHERE

British Phosphate Commissioners, Ocean Island, Australasia, followed their initial installation of a Cottrell Precipitator with two repeat orders in which modern technical design was used to overcome troublesome corrosive properties in their phosphate rock dryer gases.

Step by step, for thirty years, the Cottrell Process of dust and fume control has been developed in line with upward industrial trends toward higher temperatures, larger capacities and more rigorous demands.

The Cottrell Electrical Process is positive. By suitable technical design it is adaptable to any specific condition. It collects sub-microscopic particles that can be controlled by no other means. Millions of cubic feet of gas per minute can be cleaned at any desired efficiency and at temperatures as high as 1400° F. Single installations are collecting hundreds of tons of dust per day, effectively eliminating harmful results to health, machinery and property.

Our service includes plant surveys, dust determination, dust and fume control and odor elimination. We are responsible for complete design and installation and guarantee operation at a specified efficiency.

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through it, then the capacity would be 8 tons of finished product instead of the 5 tons obtained by open-circuit methods.

Again, if the feed rate, plus the circulating load, were increased three times (15 tons per hr.) and the mill ground only 70 per cent., then its output would be 10½ tons per hr. as compared with the original 5 tons. This would require no more power, with the exception of that required by the classifier installation, which is a small percentage of the mill power. Perhaps, to some persons, stepping up the circulating load three times, or 300 per cent., seems impracticable, but let us say that cases have been tried where 1,000-per cent. increase in circulating load has shown economical results.

To illustrate the inefficiency of open-circuit grinding we show a grinding

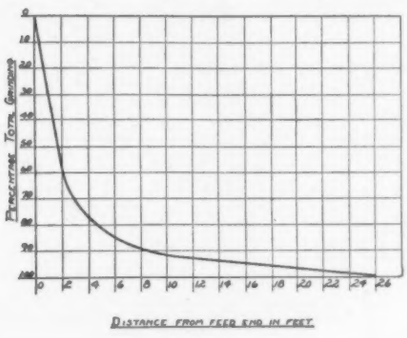

Fig. 2

diagram of a tube-mill; a standard 6-ft. by 26-ft. tube-mill operating under old open-circuit methods is used as an example. The graph (Fig. 2) will clearly show the relative pulverizing effect upon the material at each foot of length traversed. Please take careful note that 60 per cent. of the grinding is accomplished in the first 2 ft., 75 per cent. in the first 4 ft., 85 per cent. in the first 6 ft., and 90 per cent. in the first 8 ft., and the remainder of the tube-mill length (18 ft.) is used to finish 10 per cent. of the material fed. In other words 30 per cent. of the mill's length is doing 90 per cent. of the grinding, while 70 per cent. of the length is grinding only 10 per cent. of the material.

It is not difficult to forecast the result if 18 ft. of the tube-mill were cut off and the first 8 ft. only used in closed-circuit with a classifier. If the 26-ft. mill ground 10 tons of material per hr., then the 8-ft. section would grind 9 tons, 70 per cent. of the mill power would be saved and a similar percentage of up-keep, floor space, etc. would be conserved. But why stop there? Increase the feed and build up the circulating load of the 8-ft. section until it finishes only 70 per cent. of its feed instead of 90 per cent. as formerly, and its output is immediately increased to an amount equal to 70 per cent. of the entire feed, including the circulating load. Thus, if these loads were doubled (20 tons per hr.), then the mill capacity would be stepped up to 14 tons per hr. (0.70 × 20). The only additional power would be that taken by an elevator and air-separator (approximate 25 hp.).

The tube-mill need not be cut off to work efficiently, for by using it as it is and increasing the load to be pulverized and by not requiring that the mill finish within itself but only grind (depending on the separator to regulate fineness) the entire character of the graph will be changed and the efficiency will be distributed much more evenly throughout the entire length of the mill.

Reviewing the Argument.—Now to retrace our steps. It has been shown that any mill operating in open-circuit is limited in its output by its ability to finish, to the required fineness in one passage through, all the feed given it. It has been shown that it is not possible to regulate its fineness within close limits, because of the varying physical characteristics of the material being fed; and that to obviate errors and be sure of his fineness the operator underfeeds to counteract physical differences in the material and thus overgrinds and penalizes output. To change the quality (fineness or coarseness) of this product the operator must readjust his feed to meet the new conditions, and if he is compelled to grind to extreme fineness, beyond the commercial ability of the machine to finish within itself, his output falls off to a negligible quantity, the cost of which makes it impracticable.

To-day the control of quality (fineness) in any output and the assurance of this quality day in and day out (uniformity) to satisfy the modern demand are of great and increasing importance. The trend of industry is toward finer and finer product specifications. No longer will purchasers, or users, be satisfied with a variable result; they demand accuracy and uniformity and large production. Old methods are inadequate, slow, expensive, inaccurate and non-uniform; in fact, for the finer specifications, they are incapable of production. The closed-circuit method meets all these conditions.

Any mill will produce a portion of its output to any fineness and the modern separator will classify its product and take out the fines to any reasonable mesh and do it accurately, uniformly, and reliably, day in and day out. Whether the mill furnishes 90 per cent. or only 10 per cent., that part of the product wanted, whether 60-mesh or 350-mesh, is removed, separated from the coarser particles and reclaimed. The remainder ("rejects") is reground, and it is of no consequence whether or not this unground or partially-ground oversize passes through the mill a dozen times before it is finally reduced to satisfy the finished requirements, for it will eventually be ground and removed by the classifier with no handicap or penalty to the pulverizer.

Thus, the principle of closed-circuit grinding is to utilize two separate, independent machines but in close coöperation with each other. The function of the first is to grind and grind only to maximum capacity, unhindered by cushioning fines, or by overgrinding, unhandicapped by the withholding of fines awaiting the reduction of coarser particles before discharge, unhampered by restricting its output to a definite mesh, without the handicap of plugging, wearing, internal screens to baffle its effectiveness. The other, a separator, is a machine built to separate only, large enough to handle any reasonable circulating load, whose output is unaffected by coarse particles, or load, or usual dampness, or the amount of fines in the material fed to it—a machine which is subject to quick and accurate

Fig. 3

adjustment for modifying products within a wide range (Fig. 3). A separator or classifier which requires no attention is very durable and requires a small amount of power.

Great increase in capacity is evident and as this is accomplished at no increase in power used, except that caused by the addition of the separator installation, it is equally evident that power costs per ton of output are materially decreased by closed-circuit

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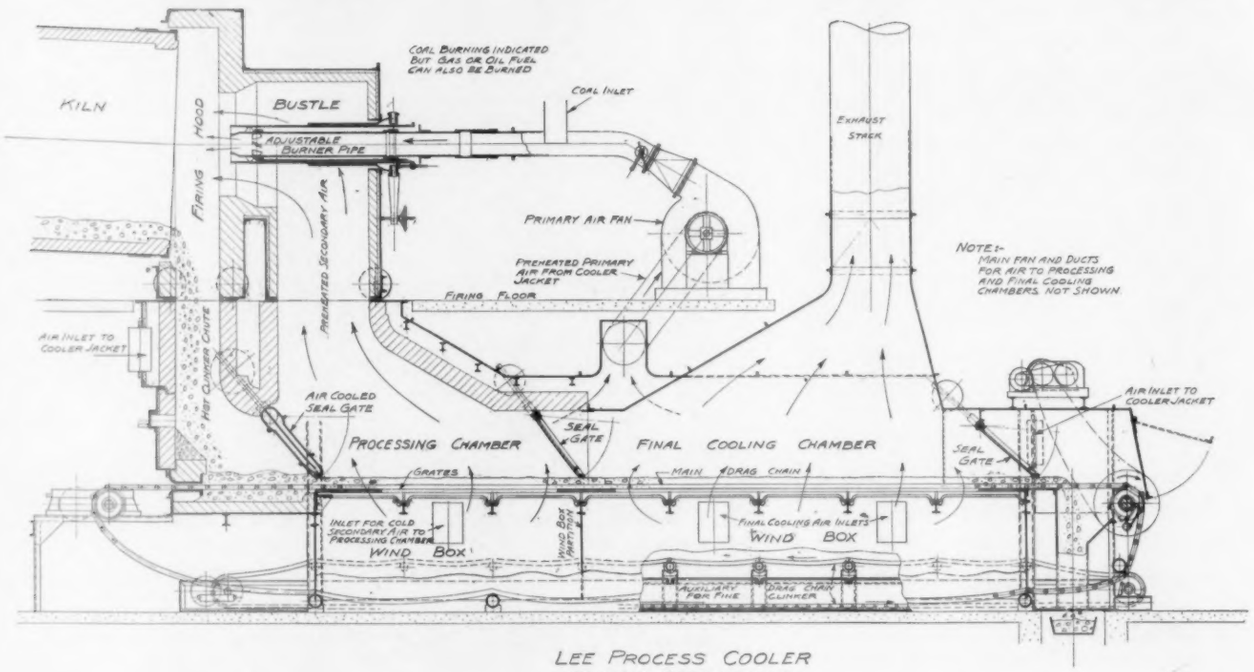
IMPROVES PRODUCT — INCREASES PRODUCTION — CUTS COSTS

A COMPLETE SYSTEM OF CLINKER TREATMENT AND COMBUSTION IN ONE MACHINE . . . . THE ORIGINAL AIR-QUENCHING CLINKER COOLER AND ACCLAIMED LEADER IN ITS FIELD



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★ SAVES additional fuel due to efficiency of combustion and its control by means of adjustable burner equipment which is part of the cooler.

★ SAVES power by producing more easily ground clinker.

★ SAVES expense of finally cooling the clinker by other means.

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Finished product has higher strength and easily meets exacting requirements.

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grinding. To make this clearer, the accompanying table illustrates the point.

A 7-ft. by 24-ft. tube-mill in a cement plant grinding limestone is used as an example. This tube-mill, formerly operated in open-circuit, had a capacity of 13 tons per hr., grinding to a fineness of 97 per cent. passing a 100-mesh screen with an expenditure of 500 hp. as represented by the first line in the table. The other items illustrate the output and power used by the same tube-mill grinding to the same fineness in closed-circuit with a selector. It will be noted that by doubling the circulating load (from 13 to 26 tons) the mill discharges a product of which only 90 per cent. is of the required fineness, but we have passed through the system twice as much material in the same time, *i.e.*, at twice the speed, with the result that the total output of finished product is 23.4 tons instead of 13 tons as formerly finished by the open-circuit method; and even though we have the added power of the selector unit (45 hp.) our power per ton of finished output has dropped from 38.4 to 23.3 hp.—an increase of capacity of 10.4 tons per hr. and a power saving of 15.1 hp. per ton.

It will be noted that by further building up the circulating load a progressive increase in output and decrease in power is registered until a maximum resulting economy is reached, or when the load to be pulverized reaches 65 tons per hr. or five times the open-circuit feed rate, when we have a capacity of 39 tons per hr. with a total power expenditure of only 13.9 hp. per ton. This shows an increase of 26 tons per hr. in output or three times that obtained in open-circuit (13 tons) and a power saving of 24.5 hp. per ton of output, approximately only one-third of the power used in open-circuit. Again note that the next increase of circulating load shows no saving in power and no increase in output, therefore, there is no advantage in further building up the circulating rate.

These figures are enlightening, for while they are theoretical and are based upon a selector efficiency of 100 per cent., yet in actual practice it is safe to say that one may count upon a minimum increase in output of 50 per cent. and a maximum of 200 per cent., depending upon the equipment used, the material being ground, the fineness desired, and the plant arrangement.

The advantages gained are: (1) large increase in output; (2) accuracy and uniformity of product; (3) fineness of product; (4) complete control of output; (5) labor saving, as neither mill nor separator require attention; they are automatic.

There is another very important advantage involved in closed-circuit grinding and that is the cooling effect of large circulating loads passing through a grinder and selector. Heat generated by the crushing effect and also by the friction of the grinding media is quickly dissipated by the great volume and steady flow of the material rapidly passing through the system. The cooler the mill, the greater its capacity, the less the up-keep and power. In the reduction of cement clinker by closed-circuit methods the heat is reduced from 50 to 100 deg. F. Moisture is reduced in a similar manner, and much damper materials may be ground in closed-circuit than in open-circuit, especially if an air-separator is used.

There is one more point well worth consideration. A mill operates with less power under closed-circuit methods than by open-circuit processes for the reason that the material is not allowed to accumulate within the grinding chamber; it is rushed through at a high rate of speed and discharged freely; therefore, there is a smaller amount in the mill at any one time. This is particularly true of tube-mills, and of the roller or hammer types which use internal screens or close grate spacings. With the latter types much coarser screens or wider grate spacings are used to hasten and ease the discharge, and no attempt is made to require the mills to finish all the material within themselves.

Applications of Closed-Circuit Grinding.—Now a word in reference to another application of closed-circuit grinding. Most finishing mills require a preliminary grinder to give them a feed upon which to work most effectively. This preliminary grinder may be operated in closed-circuit with a classifier, independently, or in connection with the finishing mill. Each may use the same classifier, or each may use a separate classifier, depending upon the result desire. For instance, if a hammer-mill is used as a preliminary grinder to a tube-mill and the final output of the tube-mill is to be 100-mesh, then one of four methods can be used:

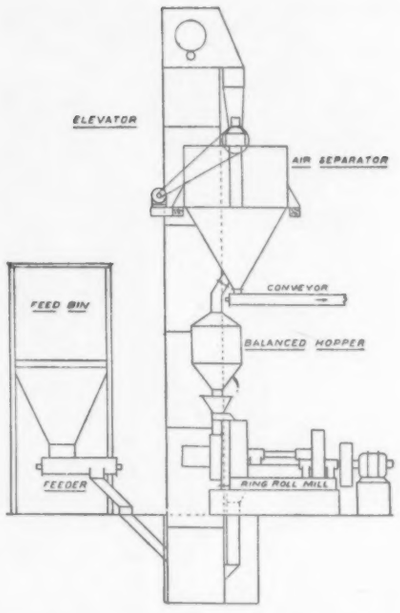

Fig. 4. Closed-circuit unit with ring-roll mill and air separator.

1. Hammer-mills are noted for their ability to produce a large percentage of 100-mesh material on the first "break". They can grind to 80 per cent. or 90 per cent. of 20-mesh economically, but finer than this they can not successfully finish their own "tailings". Therefore, to take advantage of the fines produced, they may be very effectively operated in closed-circuit with an air-separator which will remove the 100-mesh material made by them and thus relieve the tube-mill of the waste effort of over-grinding what is already sufficiently reduced. The amount of "fines" made by the hammer-mills and reclaimed from the system is clear "velvet"—an inexpensive increase in plant output.

THEORETICAL COMPARISON OF CLOSED- AND OPEN-CIRCUIT GRINDING, ASSUMING THAT SELECTOR EFFICIENCY IS 100 PER CENT.

Tube-Mill Size (ft.)	Power Required (hp.)				Percentage of Fines in Mill Discharge	Circulating Load (tons per hr.)	Finished Output (tons per hr.)	Power per Ton of Output (hp.)
	Mill		Selector	Total				
	Open-Circuit	Closed-Circuit						
7 by 24	500			500	100	13.0	13.0	38.4
7 by 24		500*	45	545	90	26.0	23.4	23.3
7 by 24		500*	45	545	80	39.0	31.2	17.4
7 by 24		500*	45	545	70	52.0	36.4	15.0
7 by 24		500*	45	545	60	65.0	39.0	13.9
7 by 24		500*	45	545	50	78.0	39.0	13.9

* The power in practice actually decreases as the circulating load increases owing to the rapidity of the material's passing through the mill, there being a smaller load in the mill at any one time.

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See Bulletin No. 302

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2. By using the same separator in closed-circuit for both the hammer-mill and the tube-mill.

3. By the use of an independent separator for each mill.

4. By using a screen and separator after the hammer-mill, the screen to give the separator a product of 16-mesh and finer, from which it removes the 100-mesh and finer, returning the rejects (16- to 100-mesh) to the tube-mill, the rejects from the screen (plus 16-mesh) returning to the hammer-mill for further reduction.

The same air-separator can be used also for the tube-mill. In such an installation the hammer-mill grinds to 100 per cent. through 16-mesh in closed-circuit with a screen and at the same time the 100-mesh material is reclaimed from its product. The air-separator "rejects" (minus 16- plus 100-mesh) are an ideal feed for the tube-mill, and the latter working in closed-circuit with the same air-separator is itself working most effectively. Similar installations can be made with other preliminary grinders. It is just a question whether they make sufficient finished fines to be removed at that stage, or whether a combination of an air-separator and a screen lay-out is desirable. With the facts available it is easy and simple to ascertain the most economical method to adopt. In any case closed-circuit operation can probably be used at great profit.

Let us again stress the fact that while closed-circuit grinding is simple in both theory and effect, it is most desirable that it be approached in the light of engineering experience and knowledge because, like every other grinding process, there is a right and a wrong method of application. Great circulating loads are a necessity sometimes; correct balance is imperative always; and all auxiliaries must be of proper proportions and properly adapted to allow free and even flow of the material and correct blending of the new feed with the circulating load to that of the pulverizers so that the most advantageous and profitable results can be looked for. The air-separator in itself is but a means to an end; it is a cog in the wheel traveling toward the achievement of a definite purpose. It will become an asset or a liability in direct proportion to the amount of engineering knowledge and experience given to the study of its application and the results to be expected.

Marquette (from page 51)

four of these barges which have a capacity of 5,000 bbl. each and unload by means of Fuller-Kinyon pumps. These barges are used, mainly to haul bulk cement to the company's silos and pack-houses at Memphis and St. Louis, which have capacities of 26,000 bbl. and 54,000 bbl. respectively. These barges and terminals were completely described in an article published in the March 26, 1930 issue of PIT AND QUARRY.

All the coal used at this plant is shipped by railway from Southern Illinois fields to the company's terminal at Grand Tower, Ill., 30 miles upstream from the plant. There the coal is discharged from cars into a track hopper from which it is conveyed to bins. Barges are loaded from these bins by means of belt-conveyors and chutes. Six barges are used for coal haulage alone. Coal is unloaded at a separate dock near the plant by means of a stiff-leg derrick and clam-shell bucket. This derrick is also used to load commercial crushed stone into barges. All the barge towing is done by two Diesel tugs owned by the company. The tug William Dickinson was completely described in the June 3, 1931 issue of PIT AND QUARRY shortly after it went into operation. In 1936 the company purchased the tug "Marquette," which is driven by a 120-h.p. Fairbanks-Morse Diesel engine.

The power for this plant is generated by steam from four Heine 705-h.p. waste-heat boilers with Foster-Wheeler superheaters. A Heine coal-fired boiler on which a Hoffman Firite stoker was recently installed is used as an auxiliary. All these boilers are connected to the stack by a common flue. The waste-heat boilers supply sufficient steam to operate the entire plant and quarry. The auxiliary boiler is required only when additional clinker from storage is being ground. A series of hoppers in the flue settle out the dust. A flue from the driers to the stack also has hoppers from which screw-conveyors return the dust to the driers. The new 350-ft. concrete kiln stack was built by the Alphonse Custodis Chimney Co. and has a 28-ft. inside diameter at the bottom and a 16-ft. diameter at the top.

Water for the boilers is pumped 2,600 ft. from the river by two De-Laval 4,000-gal. per min. pumps mounted on a barge. Two flexible joints in the pipe-line make it possible for the barge to rise or fall with the river level without hindrance to operations. At the power-house there is a spray pond with Sprayco nozzles, a Griscom-Russell evaporating system and a preheater.

Power is generated by two General Electric 3,000-k.w. turbo-generators and an 800-k.w. Westinghouse unit which is used as an auxiliary. Both large units are equipped with C. H. Wheeler condensers. Power is generated at 440 v. and this is reduced to 110 v. for lights. The kilns are driven by 250 v. direct current which is supplied by motor generators.

The preliminary-crushing and stone-washing plant with incline from quarry at extreme right.

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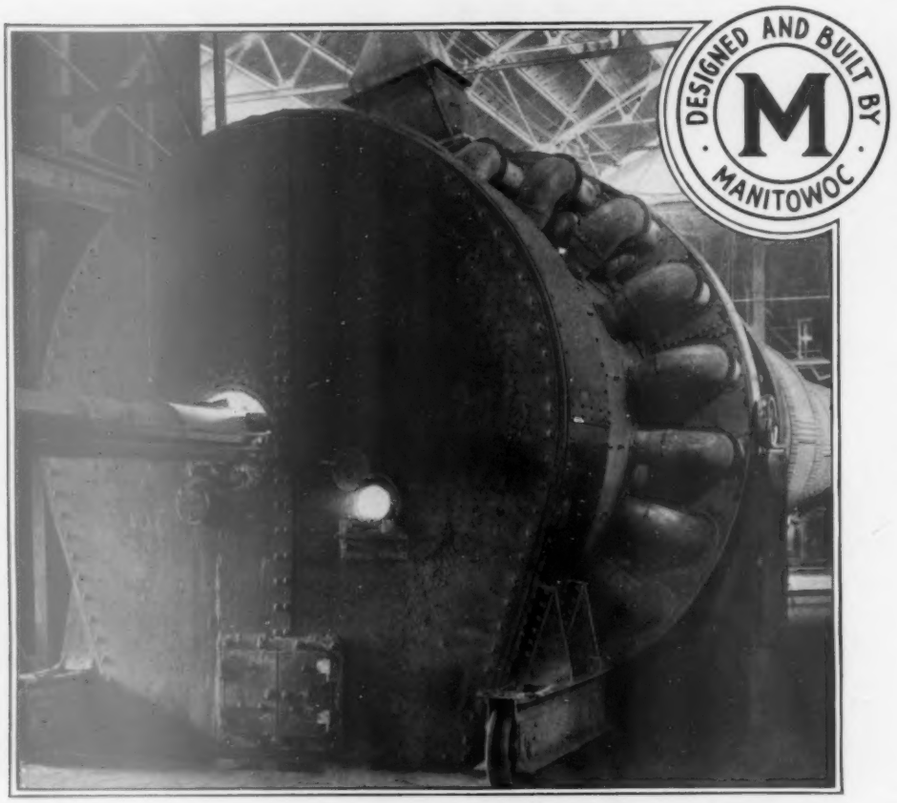

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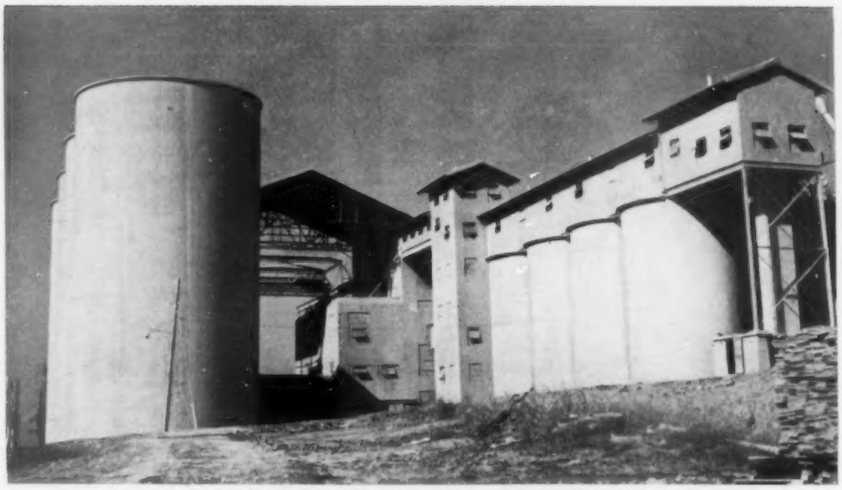
THE plant of the Universal Atlas Cement Co., near Waco, Tex., has the distinction of being the last new dry-process cement plant to be built in this country. A complete description of this plant was published in the December 4, 1929 issue of PIT AND QUARRY shortly after it was built by the Atlas Portland Cement Co. which was later merged with the Universal Portland Cement Co. to form the present company. This plant incorporated many advanced features, including the then new Fuller-Kinyon blending system which made possible the accurate and intimate blending of dry raw materials.

Late in 1936 a number of improvements, which keep this plant in the forefront of those that uphold the banner of the dry process, were completed. In the order of their sequence in the flow of material through the plant these improvements were as follows:



The new cement-storage silos at left with raw-material storage silos at right.

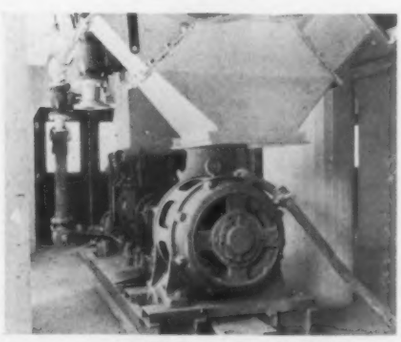
SEPARATORS IMPROVE GRINDING EFFICIENCY

The installation of two separators in closed-circuit with the raw-grinding compartment mill; the installation of a separator in closed-circuit with the clinker-grinding mill; the erection of additional concrete cement-storage silos from which the cement is reclaimed through portable pneumatic pumps.

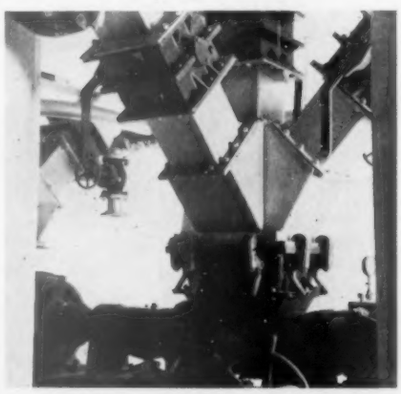
The original raw-grinding installation was an 8-ft. by 7-ft. by 45-ft. four-compartment mill. The product of the first mill compartment is discharged on a peripheral screen with 0.10-in. openings from which the coarse material is returned to the first compartment for regrinding.

The fine material passing the peripheral screen is carried by a screw-conveyor to a bucket-elevator, whose discharge is split to the two new 14-ft. air-separators. The separator tailings are discharged by means of a screw-conveyor into the second mill compartment, from which they progress through the third and fourth compartments. The material discharged from the fourth compartment joins the flow to the separators.

The fine material from the separators is finished raw material and is carried by a screw-conveyor into a 7-in. Fuller-Kinyon pump which forms a part of the raw-material blending system. This pump was moved to its new location from its former position at the end of the mill whose discharge was formerly the finished raw material.



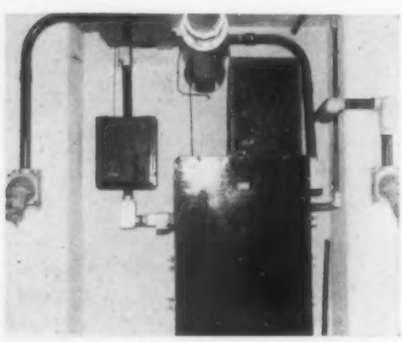
One of the two movable pumps under the new cement-storage silos.



Another view of one of the pumps, showing three rotary feeders and spouts.

Operating under the original set-up the raw mill had a capacity of 127 bbl. per hr. of material ground to a fineness of 85.5 per cent. through 200-mesh. Raw material is now being ground to a fineness of 93 per cent. through 200-mesh at the rate of 120 bbl. per hr. This finer product has resulted in better kiln operation. It is now planned to increase the load of grinding media in this mill and this will result in a larger output of the present fine product than was formerly obtained with the coarser product. All the raw material is ground similarly regardless of the type of cement to be made from it.

Better control of the burning was made possible by the installation of an automatic draft-control system with a draft gage on the kiln control board. A temperature recording pyrometer was also installed to record the temperature of the exhaust gases at the end of the kiln and in the flue and to indicate the conditions of combustion. This equipment has made possible closer control of burning conditions



Electric wall outlets, resistor, etc., for pumps under new cement silos.

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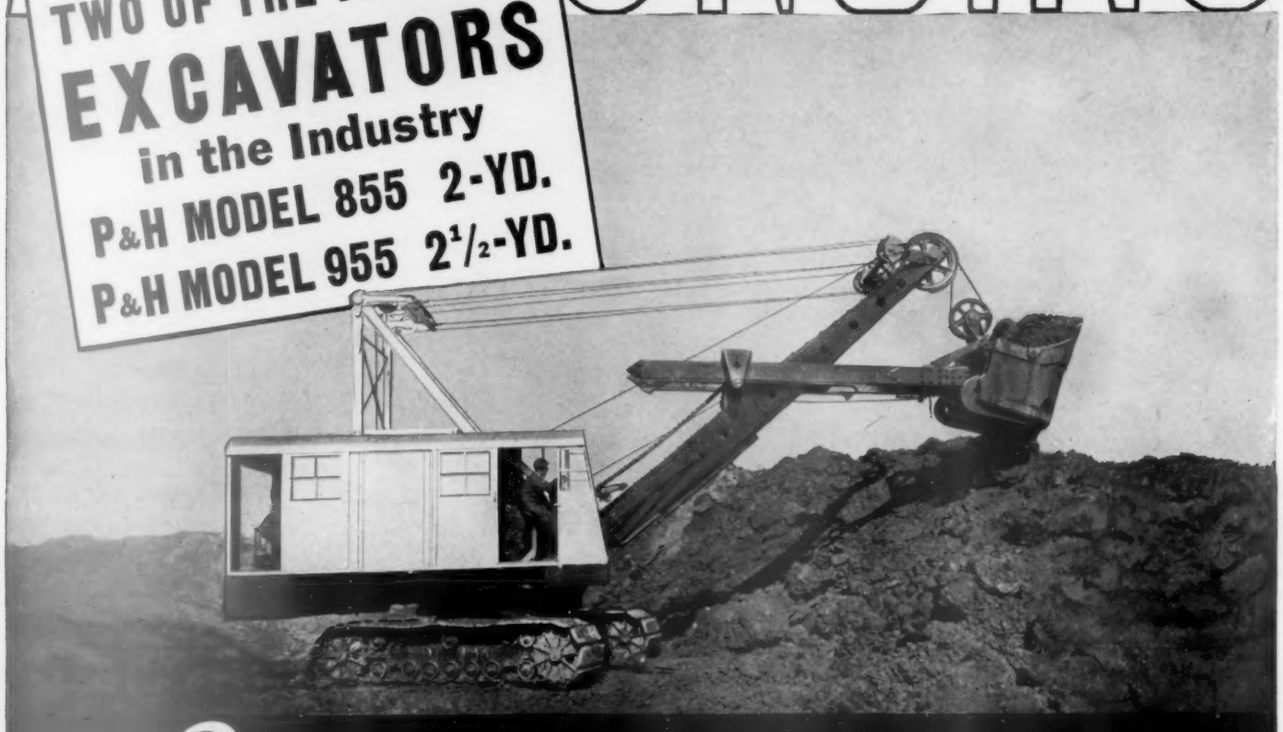
P&H MODEL 955 2½-YD.



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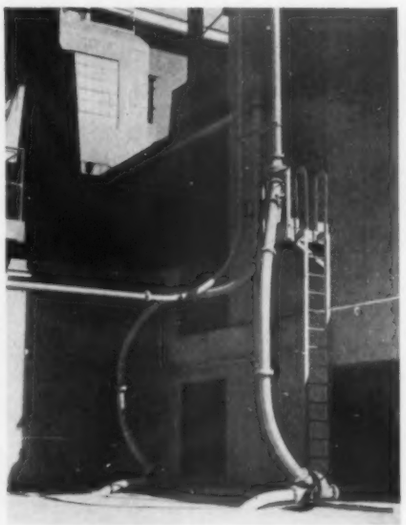
in the kiln with a resultant saving in fuel.

The clinker-grinding mill is identical with the raw mill in size and design. The product of the first compartment was discharged on a peripheral screen with 0.10-in. openings from which the coarse was returned to that compartment for regrinding. The fine material passing through this screen progressed through the next three mill compartments and was discharged as finished cement. A 7-in. Fuller-Kinyon pump conveyed the cement to the original storage silos, which had a capacity of 75,000 bbl.

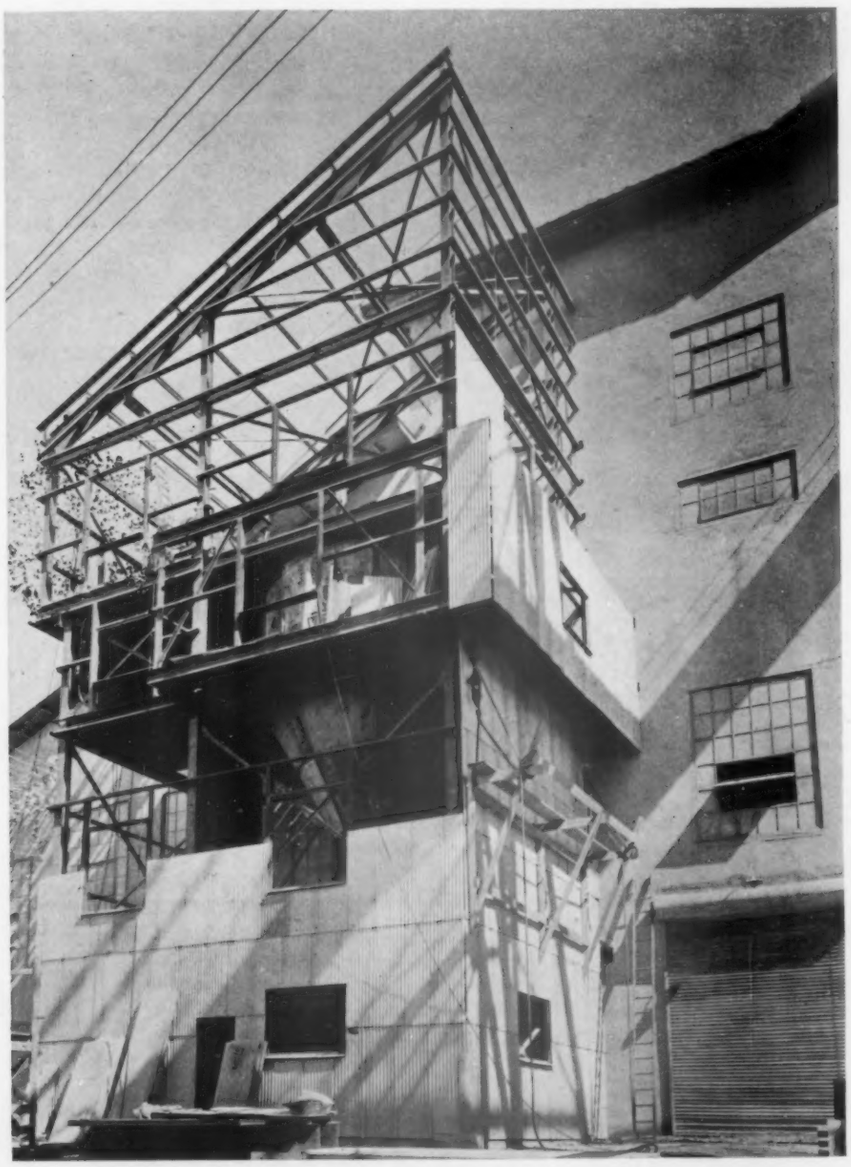
This procedure is still followed except that the material coming from the fourth mill compartment is now discharged to a 55-ft. steel-inclosed chain-bucket elevator. The elevator discharges this material into a screw-conveyor which feeds the new 16-ft. air-separator. The tailings from the separator are returned by means of a screw-conveyor to the second compartment of the mill for regrinding. The fine product of this separator is finished cement and is discharged direct to the same 7-in. Fuller-Kinyon pump which has been moved to a new location. This pumping system delivers the cement to either the old or the new silos as desired.

At the same time the separators were installed metal filling was placed between the liners and the mill shell and provisions were made for spraying water on the shell. This resulted in a much lower temperature inside the mill which, with the separator, is responsible for most of the increased output of this mill. At the same time a change was made in the sizes of grinding balls used in the third and fourth mill compartments.

This mill formerly had a capacity of 103 bbl. per hr. of material ground to a fineness of 93 to 94 per cent. through 200-mesh or to a specific surface area of 1,750 sq. cm. per gram. Now it will produce 111 bbl. per hr. at the same specific surface area when making standard Portland cement and is also able to grind finer for special cements.



Arrangement of conveyor piping from new silos to allow three optional flows.



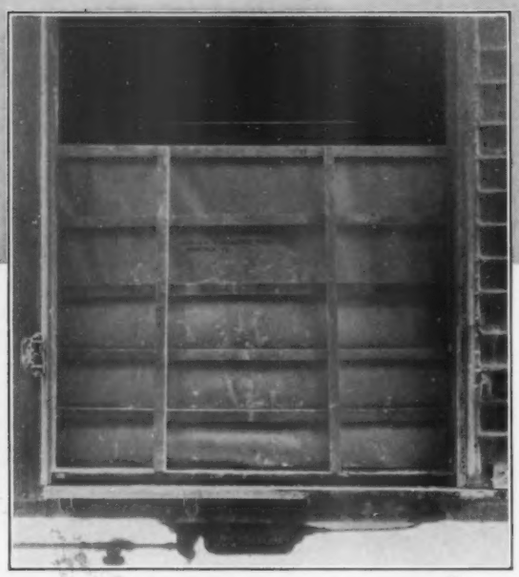
View of the new 16-ft. air-separator, installed in closed-circuit with the finish-grinding mill, with inclosure only partly completed.

The new storage system consists of four reinforced-concrete silos in a single row, each 40 ft. in diameter and 80 ft. high with a combined capacity of 100,000 bbl. Because of the unstable soil underlying these silos they are supported on 14-in. concrete columns varying from 25 to 45 ft. in depth over which the foundation slab was poured. The holes for these 186 columns were drilled by well drills down to hard shale and the concrete was poured in them. The 30-in. foundation slab is reinforced with structural-steel beams. A 9-ft. basement under the silos was poured in stationary forms and slip forms were used in pouring the silos.

In this basement are the two 8-in. Fuller-Kinyon pumps which are mounted on carriages running the length of the silos on two parallel tracks. These carriages are moved by means of hand wheels, and under each silo there are two connections, one for each pump. Each of these connections has three spouts fitted with rotary valves so that the six spouts under each silo can virtually clean out the silo if desired. At each unloading position a short section of flexible hose connects the pump to the air-line. Plug-in sta-

(Continued on page 69)

Old-Time Grain Doors *Replaced*



LIGHT LEAKPROOF
SUPER FIBRE WITH
puncture resistance
OF 400 LBS. TO THE INCH

Saves Labor and Dead Weight

This low cost unit of water-resistant super fibre reinforced with wood weighs only thirty-five pounds, yet it has passed every possible test of its dependable service. It is the H-F Dunnage Door, the non-leaking seal of freight car doors.

Shippers of grain, fertilizer, cement, coke, lime, alkalis and similar loads need this protection from rain, spoilage and waste of time and freight costs. Thousands of cars are equipped with these doors every year. Shippers are finding out every day the remarkable economy and perfect satisfaction of this method. Write us for prices and our liberal test offer.

HUMMEL - FOLEY CORPORATION
Hopewell, Va.

THE H-F DUNNAGE DOOR

By P. F. STAUFFER
Sales Manager, Fuller Co.

Power Saving in Proper Air-Compressor Applications

THE uses of compressed air in a wide variety of applications have reached a high degree of development in the cement industry, but its production and distribution, with a few isolated exceptions, remain unnecessarily wasteful of power. The power losses are substantial but are generally not understood or appreciated and the total cost of air is discounted against the convenience and specific economy of compressed-air-operated equipment.

The least understood but greatest source of power waste is in the conventional central compressor station, which supplies substantially the entire plant requirement of air and at a constant and relatively-high pressure. Modern, large compressors are in themselves highly efficient but they are not adapted to the operating conditions of cement mills, and particularly mills purchasing power on a demand rate. The principal uses of compressed air at a modern mill comprise the operation of quarry drills; dry raw-material conveying and blending systems or slurry agitation; cement-conveying systems; aeration of bins; compressed-air tools; and air hoists. To satisfy a relatively-small part of the total requirement, with reference to both volume and operating time, the central station compresses the entire supply, usually to 100 to 125 lb. gage pressure, although the greater volume of air must be reduced in pressure or could accomplish its work at pressures below 50 lb. Accordingly, the power required to elevate the pressure above the actual requirement is a net loss, and the loss is disproportionate as the power required to elevate pressure increases on an ascending curve due to increasing slippage and heat.

In contrast to this conventional practice individual compressor installations, at the point of use of substantial volume, designed to satisfy each specific volume and pressure demand, eliminate the waste described above and effect additional but more obvious economies. Among the latter advantages of the "tailor-made" installation is the elimination of the costly network of transmission lines which radiate from the central station, with maintenance expense, friction loss and very considerable line leakage. Reference to a table of air flow through orifices will show the astonishing losses in leakage at high pressure. The quarry and machine-shop require high-pressure air but consume small quantities, usually operating only for a part of one shift, and the requirement should be served by small individual installations that need be operated only when a demand exists, to avoid operation of a large central-station machine to satisfy a small demand, or a small part of a large demand.

COMPRESSOR APPLICATIONS AND MINIMUM MONETARY SAVINGS

Plant	Air Quantity (*cu. ft. per min.*)	Maximum Required Pressure (*lb.*)	Horsepower Differential	Kilowatt Differential	Saving Per Hour at 1c per Kw.
"A"	1930 (2)	17	191	142	$1.42
"B"	2400 (2)	38	132	98	.98
"C"	1070	32	70	52	.52
"D"	934	30	66	49	.49
"E"	900	35	55	41	.41
"F"	2080 (4)	38	114	85	.85
	1792 (2)	75	38	28	.28
	232 (1)	100	...	...	...
"G"	720	25	58	43	.43
	738	18	72	54	.54
	573	28	42	31	.31
	335	30	24	18	.18
	117	50	4	3	.03
"H"	370	18	36	27	.27
	445	15	47	35	.35
"I"	730	60	15	11	.11
	254	50	9	7	.07
	1445	35	86	64	.64

When the purpose in using compressed air is to accomplish work or a desired effect by volume flow, rather than by direct application of pressure, as in conveying, slurry agitation, aërating bins and dusting motors, a further power saving, novel to the cement industry, can be effected by operating an individual compressor continuously at substantially-constant volume. The resulting savings are additional to those discussed above and can best be illustrated by reference to a Fuller-Kinyon cement-pumping system served by an individual, direct-connected compressor.

Modern low-pressure Fuller-Kinyon pump systems range in pressure requirements from 10 lb. to an extreme maximum of 50 lb. gage. The actual up-stream pressure required for the most efficient operation is only that necessary to overcome the resistance of the system, as represented by its length and the actual quantity of material handled, to allow the necessary volume flow at any time. The usual system is subject to variable loads in capacity, conveying distance or both, and the maximum efficiency is approached when the actual brake-horsepower consumption is variable in accordance with the work done. By directly connecting the compressor discharge to the air manifold of the pump, or to the air ring of pumps of older types, the volume flow is continuous and substantially constant. The discharge pressure then automatically follows the back-pressure of the system, represented by its length and the material actually being handled, *i. e.*, the discharge pressure automatically becomes that necessary to overcome the load and consequently the brake-horsepower consumption is limited to the actual work being done at any time. By thus avoiding artificial elevation of the pressure in the transport system and the consequent back-pressure on the pump screw and the material contained in it the screw-motor horsepower consumption like-

HOW MEN IN THE CEMENT AND GRAVEL INDUSTRY DEPEND ON BUFFALO SCALES

ESTABLISHED 1861

This Series 3200 Buffalo Truck Scale installed at the Buffalo Plant of the Great Lakes Portland Cement Company is one of many serving the Cement Industry.

Men responsible for operation and maintenance of cement mills are depending on Buffalo Scales to stand the gaff under continual punishment of their heavy duty truck deliveries. Maintained accuracy . . . rugged construction . . . exclusive single link design . . . minimum maintenance . . . you get them ALL with latest type Series 3200 Buffalo Scales.

In addition, Buffalo offers a Plan which gives you every advantage and economy of modern Buffalo Scales immediately with low cash outlay. This Buffalo Plan provides that same convenience with which the investment in motor trucks and other heavy equipment can be distributed over a period of time.

The complete line of Buffalo Scales offers the correct type and size for all branches of the cement and gravel industry, including Truck Scales, Track Scales, Batching Scales, Highway Scales and others for use wherever materials must be accurately weighed.

Write for Complete information on the latest developments and improvements in scales and the Buffalo Plan that provides for immediate installation with low cash outlay.

THE BUFFALO SCALE COMPANY *announces* A NEW PLAN THAT GIVES YOU THE SAVINGS OF **NEW SCALES IMMEDIATELY** *with low cash outlay*

BUFFALO SCALE COMPANY

1200 Niagara Street — **BUFFALO, N. Y., U. S. A.**

Buffalo
Chicago
Cleveland
Detroit
Los Angeles
New York
Philadelphia
Pittsburgh
San Francisco
St. Louis

Cutaway view of latest type Buffalo Scale showing exclusive Single Link construction. Structural Bridge design and minimum excavation and foundation required.

wise follows that of the compressor motor.

To illustrate the included saving, by contrasting the use of a central-station air supply with individual compressor installations designed to satisfy specific conditions of use, it may be assumed that the cement-pumping system is one under constant load, *i. e.*, of constant capacity and but one conveying point. Assuming also that the central-station compressor is an efficient two-stage machine operating at 100 lb. gage pressure, and that the pumping system requires 300 cu. ft. of air per min., free air at 30 lb. gage pressure, the elevation of this quantity to 100 lb. gage pressure and its reduction to 30 lb. pressure involves a direct, minimum loss of 15.75 kw. an hr. At a power cost of 1c. per kw. a 600-hr. monthly operating period would involve a net loss of $94.50. This loss does not take into account transmission losses due to friction or leakage. If the central compressor installation was a single-stage machine, this loss would be considerably greater.

In the illustrative examples presented herewith the actual individual compressor applications of distinct types and the minimum monetary savings are tabulated. These savings likewise do not include those resulting from the elimination of friction and leakage losses, excess idling time, or the operation of a large machine to supply a small demand. Plant "F" is completely equipped with individual installations for each pressure demand, and Plants "G," "H" and "I" are individually-equipped for pressure demands below 100 lb.

Universal

(*from page 65*)

tions supply current for the pump motors. Special clamps and rubber seals connect the pumps to the unloading spouts and a section of 8-in. hose connects the cement discharge line. Each pump has a capacity of 500 bbl. per hr. and is driven by a 150-h.p. motor. These pumps operate with an air pressure of 35 lbs. This air comes from a centrally-located compressor-house in which are three 1,500 cu. ft. per min. air-compressors.

These pumps ordinarily transfer cement from the new silos to the packer-feed bins in the pack-house adjacent to the original silos. This system is so arranged, however, that these pumps can be used to transfer cement from any one of the new silos to any of the other silos in either the old or the new storage bins. Automatic electric controls shut off these pumps whenever the silos or packer bins which they are feeding become filled. A similar system stops the pump which transfers cement from the finish-grinding mill to either the old or the new storage systems.

This additional storage space was provided to make it possible to keep on hand sufficient quantities of standard Portland and special cements to fill orders when the plant is shut down or when other types of cement are being produced. It also makes possible the spreading of employment over a longer period than formerly.

1935 Construction Reports Available

The amount of work performed by the 75,047 contracting establishments in the United States in 1935 aggregated $1,622,862,000, according to a recent publication of the Census Bureau. *Construction Industry Volume One.* This was a year for which the value of construction was small in comparison with that for many of the earlier years.

The Bureau points out that the figure for work performed is not directly comparable with the figures reported by private organizations for the dollar value of contracts awarded, because of the differences in scope and content between the figures for work performed and those for contracts awarded. The Census figure for work performed represents all of the work reported by contracting establishments, whereas the figures of the private organizations for contracts awarded are based on reports for individual projects, and do not include projects below certain established minimum values. From this standpoint, the figures for contracts awarded, the Bureau states, would be lower than the ones for work performed. Data for force account construction, however, are not included in the Census figures but are, to a large extent, accounted for by the figures reported by the private organizations. Another important consideration pointed out by the Bureau is the elapse of a period of time between the award of a contract for construction and the performance of any sizeable proportion of the actual construction work.

The figure of $1,622,862,000, it is stated, represents work performed by all reporting establishments of general contractors and special trade contractors. Of the total contracts that they receive, general contractors sublet a considerable part to special trade contractors. This, however, does not result in duplication in the aggregate figure of $1,622,862,000 because each contractor reported only the work performed by his organization.

Of the $1,622,862,000 of work performed, general contractors accounted for $944,279,000, of which $398,980,000 was for building, $280,332,000 was for highways, and $264,967,000 was for heavy construction. Special trade contractors accounted for $678,583,000. Work performed in cities of 500,000 or more inhabitants amounted to $562,327,000, or 34.7 per cent. of the total, and of this amount $293,062,000 was done by general contractors, and $269,265,000 by special trade contractors. The figure of $293,062,000 done by general contractors was divided as follows: $138,040,000 for building, $34,459,000 for highway, and $120,563,000 for heavy construction.

The report, which contains 116 pages, includes information on employees and proprietors, pay rolls, operating expenses and profit or loss, new construction and repairs, and private and public construction. Summaries are presented by states and by geographic divisions by kinds of business.

A limited number of copies of this report are available free from the Bureau of the Census, 2401 Chestnut St., Philadelphia, Pa.

General view of the Universal-Atlas plant near Waco. The kilns and coolers are at left. New cement silos are visible behind clinker storage and the original cement silos are at right.

LeTourneau Angledozer cutting a new and less precipitous trail down the spoilbank to the pit. The Angledozer in this combination is operated by a LeTourneau Front End Power Control Unit, which leaves the rear of the tractor free for mounting a standard Power Control Unit or for other auxiliary equipment. (*Right*) U-12 Carryall pulling up onto the spoilbank.

Le TOURNEAU CARRYALL AND ANGLEDOZER open Marquette's new pit

To open a new cement pit near Oglesby, Illinois, the Marquette Cement Co. put a Le Tourneau Angledozer, U-12 Carryall Scraper and "Caterpillar" RD8 tractor to work removing 30 feet of overburden. The overburden is wet and soggy and is spoiled onto marshy land. To extend the spoil area, Marquette operators dump a Scraper load, then Angledoze the previous load over the edge of the spoilbank onto the surrounding marshy ground. Thus complete cycles include load, haul, dump, Angledoze and return.

A 5½-hour time study showed the outfit to be performing as follows:

Average loading distance.....100 *feet*

Average loading time.....0.84 *min.*

Haul 600 feet (half 5% adverse and half 15% adverse grade)...2.40 *min.*

Dumping and Angledozing on fill.....2.35 *min.*

Return 600 feet (all favorable grade).....1.29 *min.*

Average round trip time.....6.88 *min.*

Trips per hour.....8.8

Estimated yardage (based on 8 pay yards to the load)....70.4 *cu. yds.*

Thus does Marquette cut the cost of getting to its cement deposits. Ask your "Caterpillar" dealer how LeTourneau equipment can cut your stripping and handling costs.

R. G. Le TOURNEAU, INC.,

Peoria, Illinois Stockton, California

Cable Address: "Bobletorno"

Manufacturers of: Angeldozers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Treedozers.

*Name Registered U. S. Patent Office.

LE TOURNEAU

By FRANK H. SMITH
President
Lawrence Portland Cement Co.

Cement as an Engineering Material Is Here to Stay

THE manufacture of Portland cement has developed during the past fifty years from a modest beginning until it has become about the most important nonmetallic industry in this country, if not in the civilized world. Some of the early producers were financially weak. Some based their operations on raw materials of limited extent, and these deposits have been long since worked out. For one reason or another quite a number of these pioneer makers have fallen by the wayside, but their works live after them. True, in their day cement and concrete were not used as extensively as they are now, but most of the surviving structures built with the cement they made are sound and doing the work for which they were intended. Is it too much to say that, in spite of the "higher criticism" that we have to-day, most of this early cement was good?

Evidences of the use of cement and concrete are about us everywhere. Roads, bridges, buildings, foundations, breakwaters, dams—their name is almost legion. Yet to most people cement is a gray powder that comes in a bag, and that gets hard when mixed with water, and that is all they know about it. Perhaps there is a reason.

The cement industry has never had the publicity, the popular appeal, the glamour, if one may call it so, that have been almost an integral part of the steel business, railroading, and coal and ore mining. It has been content to go quietly about its job of turning out an essential product and making it available to whoever wants it. It is not a concentrated industry. The cost of moving coal and ore and their proximity to markets have brought about the present location of steel mills. The availability of labor, capital and materials has concentrated the automobile business in and around Detroit. But the raw materials from which cement may be made are found in almost every state in the Union. Cement is a cheap and heavy commodity. Transportation forms a large part of its delivered cost. So it has come about that the cement industry, though large in the aggregate, is made up of many units, so located that delivery to large consuming centers may be made at reasonable cost.

There is one vitally important way in which cement differs from steel, with which it is so often associated in construction. Steel comes from the mill to the user as a practically finished product. Except for riveting, welding or other method of fabrication, it is used as received. Its properties are not modified by mixing with anything else.

Cement is hardly ever used alone and as its producer made it. It is mixed with a wide variety of materials—sand, cinders, crushed stone, slag, gravel, and other things. Its only function is to bind these various substances into a sound, solid mass. It is only a comparatively small part of the final concrete.

The maker of the cement has no control over these other things. They may be thoroughly good and entirely suitable for the purpose. On the other hand they may be, and all too frequently are, not at all proper constituents of concrete. They may, and sometimes do, bring about the failure of concrete in which they are used, though when first made it may have appeared to be sound in every way. Again, the manner of making and placing the concrete composed of sound materials has a profound influence on its strength and durability.

The testing of cement has been brought to a very high state of perfection and exactness. Can the same be said of the things with which it is mixed? Not always. And then again it must be admitted that there is an economic urge—a dollars-and-cents urge, if you will—to use the aggregates nearest at hand. Usually, but not always, good concrete can be made from them. But if there are signs of failure, little is usually said about the aggregate. Nearly always the cement is brought under suspicion, though it may have been the product of a reputable manufacturer, and may have passed every test that has been devised to insure its quality. The testing of aggregates is not on the same high plane as cement testing. It should be, and the use of cheap but unsuitable aggregates should be resisted or the consequences of failure should be accepted by those responsible.

Construction engineers have noticed occasional instances in which concrete has not given good service. It is usually easier to blame the cement than the aggregate or workmanship. The result has been a sort of rash of cement specifications differing in minor but annoying details according to the ideas of those who drew them up.

The specifications of the American Society for Testing Materials are the result of years of development and study by competent men. The society is a medium through which all those interested may express their views and present supporting evidence. It is reasonable to say then that these specifications include all that is now known of cement as a safe construction material, and that cement complying with them will do good work if properly used. If this work is unsatisfactory, the fault lies elsewhere.

America contains many notable examples of concrete construction. Where great size of dams or span of concrete arches is concerned, we probably lead the world. But in the use of concrete in smaller structural members we do not lead. European engineers have developed and now use designs for trusses, roofs and light sections that we have not felt it wise to adopt. The skilled labor necessary to do this sort of thing is not plentiful in this country and costs too much. But the world is getting smaller every day, and it is reasonable to suppose that concreting practice on the two sides of the Atlantic will approach uniformity so far as is consistent with differing labor and material costs.

Cement as an engineering material is here to stay until something better is brought forward to take its place. We as its manufacturers have a responsibility to the public to market a safe, durable product. We accept this responsibility gladly, knowing that through it we are contributing our bit to the progress that is so distinctively American.

Continued Leadership

THE position of leadership in the field of cement mill equipment manufacture is maintained only by a constant development of more efficient machinery and methods to meet the ever rising standards of the cement industry.

Some Allis-Chalmers contributions to advanced plant and equipment design.

GRINDING MILL PRACTICE

Leadership in advocating and building combination grinding mills known as Compeb Mills incorporating:

Grid division heads.

Combination division heads with outside peripheral screens for dry and wet grinding.

Return scoops for delivering material to the mill and grinding circuit at the most advantageous points intermediate to the feed and discharge ends of the mill.

Close circuiting of wet mills and more efficient grinding attained with moisture contents higher than contained in the kiln feed.

Progressive classified clinker grinding system.

Concavex grinding media having high surface contact per unit of weight.

KILN PRACTICE

Enlargement of kiln diameter in the calcining zone for improved fuel economy and the production of a more completely and uniformly treated clinker.

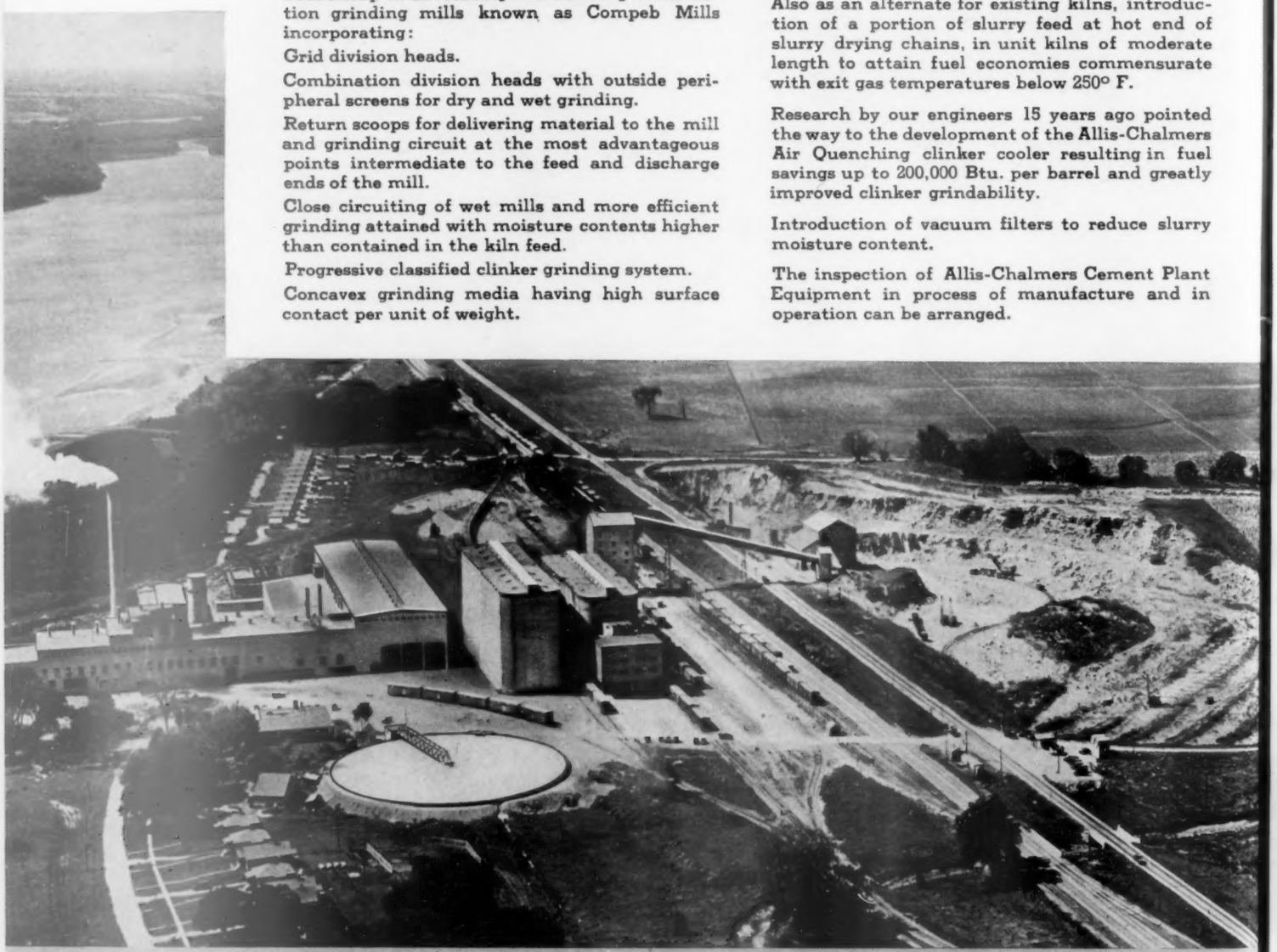
A recent development now offered to the industry incorporates a chain type slurry dryer unit in combination kilns of moderate length, permitting the extended use of chain as a heat transfer medium to attain fuel economies commensurate with exit gas temperatures below 250° F.

Also as an alternate for existing kilns, introduction of a portion of slurry feed at hot end of slurry drying chains, in unit kilns of moderate length to attain fuel economies commensurate with exit gas temperatures below 250° F.

Research by our engineers 15 years ago pointed the way to the development of the Allis-Chalmers Air Quenching clinker cooler resulting in fuel savings up to 200,000 Btu. per barrel and greatly improved clinker grindability.

Introduction of vacuum filters to reduce slurry moisture content.

The inspection of Allis-Chalmers Cement Plant Equipment in process of manufacture and in operation can be arranged.



CRUSHING AND CEMENT DIVISION

ALLIS·CHALMERS

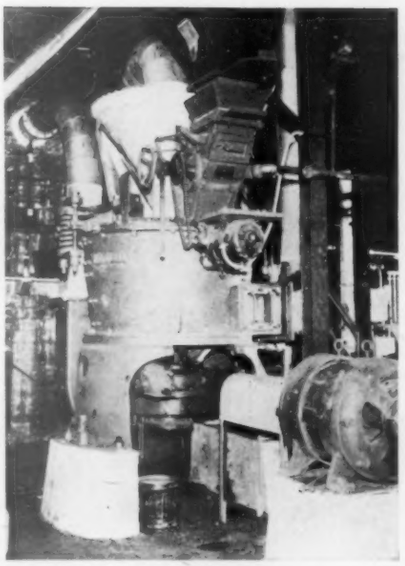
MILWAUKEE WISCONSIN

By W. E. TRAUFFER

Direct-Firing Bowl Mills and Recuperators Are Responsible for Power and Fuel Savings

IN THE cement industry in this country there remain a few companies each operating a single cement plant which seldom make the headlines. These companies might be called the backbone of the cement industry because of their stabilizing influence on the industry in general. Most of these plants were built by the men who operate them to serve the territories in which they are located. Expansion in good times and price-cutting when demand is low hold little appeal for these producers. This conservatism is also evident in the practice of waiting for new types of equipment to prove themselves in actual operation before investing in them.

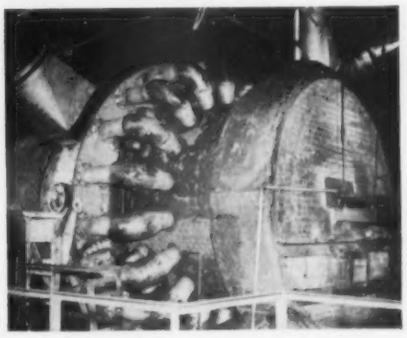
A typical one-plant company is the Diamond Portland Cement Co., Middle Branch, O., one of the first producers in that state. This company was organized in 1892 and its original 100-bbl. plant incorporated Schaffer vertical kilns. Later four 5-ft. by 60-ft. and two 6-ft. by 80-ft. rotary kilns were installed. In 1916 the present two 10-ft. by 150-ft. kilns were installed and the smaller kilns removed. The next improvement was the installation of six Allis-Chalmers 7-ft. by 24-ft. Compeb mills, three each in the raw-material and the clinker grinding departments. Sturtevant separators were installed in closed-circuit with two of the raw-material grinding mills in 1928. Vanderwerp recuperators on the two kilns and two Raymond direct-firing bowl mills went into operation on March 1, 1937. According to R. D. Raff, who recently succeeded his father, the late H. D. Raff, as president and general manager of the company, the next step in the program of improvements is the installation of 14-ft. Sturtevant separators on each of the two clinker-grinding mills and this work will soon be in progress. This latest improvement will make possible the production of high-early-strength and special cements in this dry process plant in addition to standard and modified Portland cements and plastic mortar cement.



One of the two direct-firing bowl mills with feeder and drive in foreground.

Coal was formerly discharged from cars at the plant into a hopper from which is was elevated into a rotary drier. The grinding was performed by two horizontal-shaft roll-ring mills, and a screw-conveyor and elevator fed the pulverized coal into the kiln-feed bins. Screw-conveyors fed the coal into kiln-feed pipes connected to the high pressure sides of two self-contained double fans. The low-pressure sides of these fans supplied the secondary air for the kilns.

The coal is now received and handled from the same hopper and elevator but the latter now discharges on a belt-conveyor feeding a 40-ton steel bin over the two Raymond No. 402 bowl mills. These mills are equipped with cylindrical star-type feeders and integral fans which draw the dried and pulverized coal from the mills and blow it into the kilns. They have a rated capacity of 6,300 lb. of coal per hour but have not yet been called upon to deliver that amount due to the reduced rate of operation.



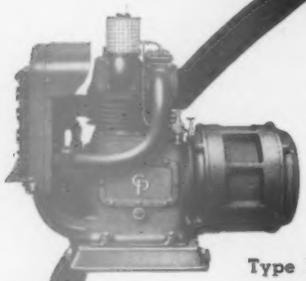
One of the two recuperators on the kilns. Hot air is drawn through pipe above to coal mill.

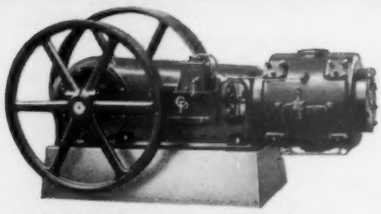
Smaller pipes connected to the discharge lines of these mills divert part of the coal into cyclones over a tank, from which a 4-inch Fuller-Kinyon pump transfers it into three drier-feed bins. The three rotary shale and stone driers are fired by fans and screw-conveyors from these bins.

The two Vanderwerp recuperators are the Type CI 6-ft. short plate type with three double rows of plates. Each has a Norblo No. 55 fan driven by a 40-hp. motor which supplies 12,000 cu. ft. of secondary air per minute. Cold air is blown into the kiln through two double rows of plates only where they are covered by the clinker bed. The first double row of plates over which the hot clinker passes is blown

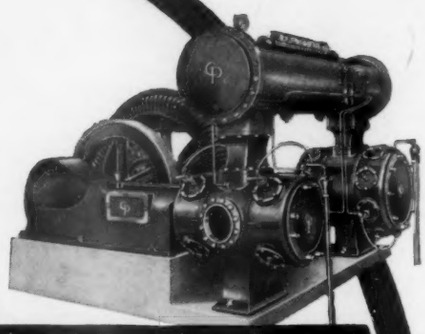
The plant of the Diamond Portland Cement Co. with coal mill and kiln buildings at left.

CHICAGO PNEUMATIC
AIR and GAS
COMPRESSORS





Type T Horizontal Single-Stage
Belt-Driven Compressor

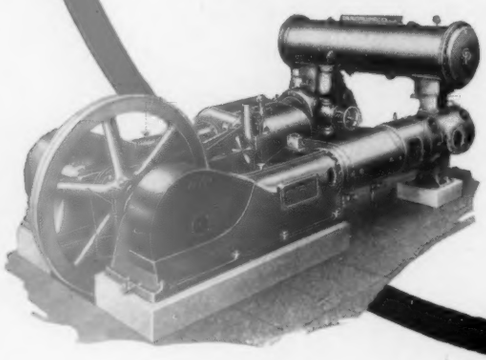


Type PM Two-Stage
Air-Cooled Compressor
With Built-in Motor

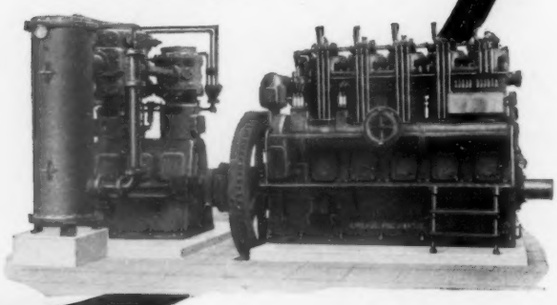
Type O Two-Stage
Direct-Connected Electric
Motor-Driven Compressor

for GREATER EFFICIENCY
UTMOST RELIABILITY
LONGER LIFE
UNUSUALLY LOW MAINTENANCE

Type O Compound Steam-Driven
Two-Stage Compressor



Type V Vertical Two-Stage
Compressor Direct-Connected
to CP Diesel Engine



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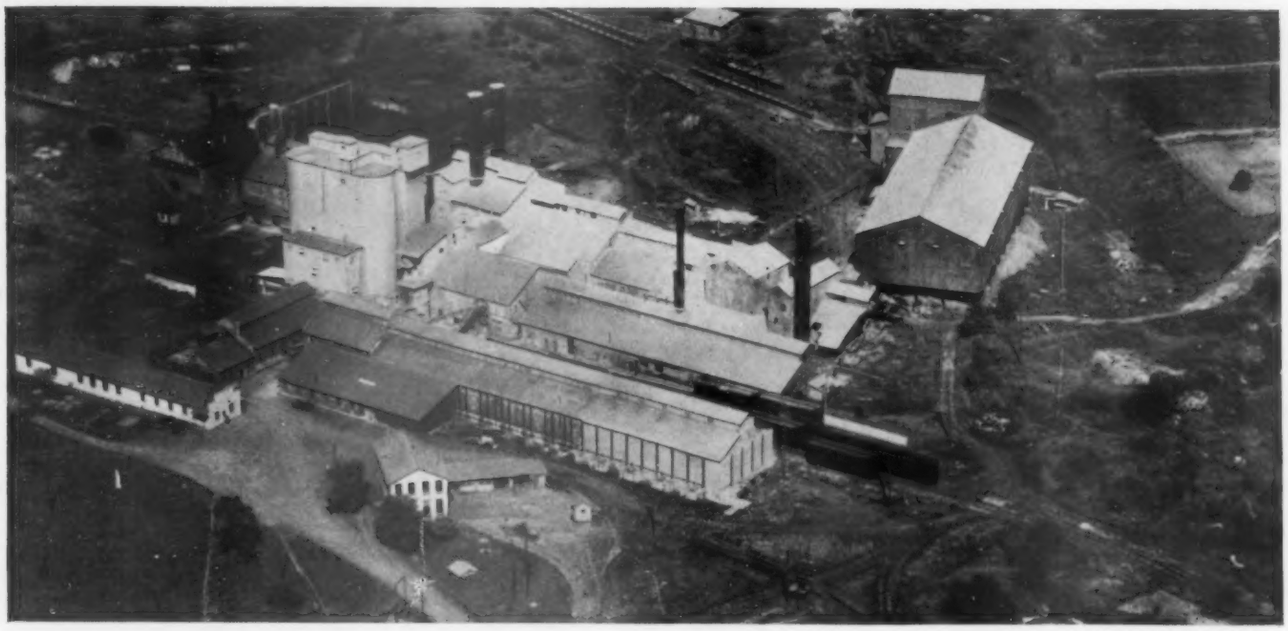


Aero-Graphic Corp. Photo

Aerial view of plant of Diamond Portland Cement Co. with coal mill and kiln buildings at left. Crusher-house and quarry tracks are in background.

around its entire circumference in order to give extra cooling.

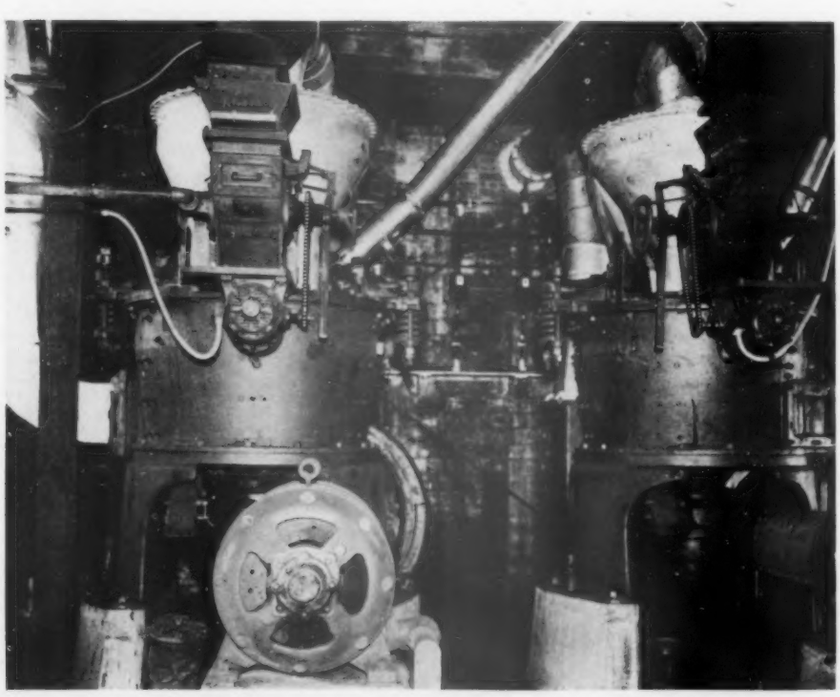
As the bowl mills and recuperators went into operation at the same time it is difficult to give definite credit to either for some of the benefits obtained. According to W. W. Kinginger, vice president, the bowl mills effected a saving of 50 per cent. or 24 man-hours of labor. They also have only 207.5 connected hp. compared to the 475-hp. connected to the old coal system. He also credits these mills with an appreciable coal saving and more uniform flame. Coal was formerly ground to 92 to 93 per cent. through 100-mesh and now is being ground to 97 and 98 per cent. through 100-mesh. Mr. Kinginger also gives these mills part of the credit for the fact that there is now less kiln-ring trouble than ever before.

The recuperators are given direct credit for an increase in the grindability of the clinker which increased the capacity of the clinker-grinding mills by 10 per cent. This increased capacity is, however, now being used to produce a finer-ground cement. The clinker is discharged from these recuperators at about 1,000 deg. F.

Hot air with a temperature of about 500 deg. F. is drawn into the coal mills from the tops of the kiln hoods through cyclones whihc precipitate dust. The primary air, which carries the dried and ground coal into the kiln, has a temperature of about 170 deg. F. and forms about 30 per cent. of the combustion air.

Experimentation with several grades of coal has made it impossible to give definite figures on fuel savings over previous methods. It has been found that the present equipment makes it possible to use a cheaper, lower-grade coal than formerly but this saving was accompanied by disadvantages inherent in such coal. The best results have been obtained with a washed and treated Ohio coal. This coal makes a better and cleaner fire and has almost entirely eliminated clinker-ring trouble. The bowl mills automatically throw out pyrites and this treated coal contains a negligible amount compared to other grades.

Each of the two kilns was formerly capable of producing 1,250 bbl. of clinker daily and it is estimated that their present capacity is considerably in excess of this figure. No definite figures are available, however, as the kilns have not been operated at capacity this year. Several years ago the company adopted a policy of spreading employment as much as possible and the kilns are being operated at about two-thirds of capacity. Even under these unfavorable conditions a 10 per cent. coal saving per bbl. of cement has been obtained and this saving should be greater at capacity operation.



The two direct-firing bowl mills which supply coal to kilns. Pipes diverting coal for driers are shown.

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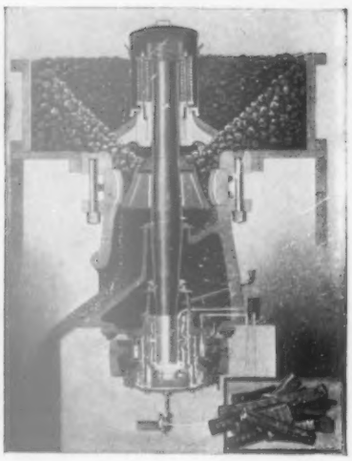

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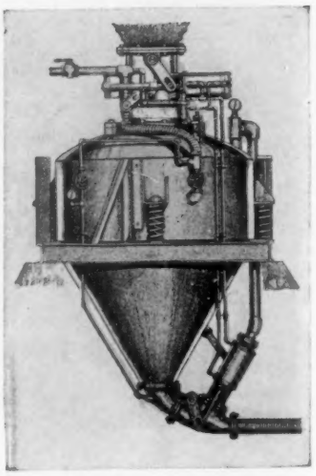

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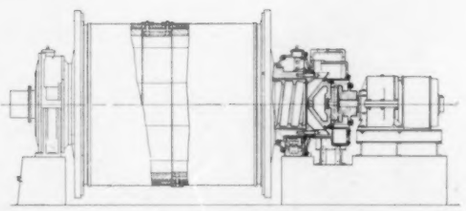

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By J. J. FOX
Chief Chemist
Missouri Portland Cement Co.

THE AUTOCLAVE—
A NEW SOUNDNESS TEST FOR CEMENT

THROUGHOUT the history of its manufacture Portland cement has been subjected to soundness tests. Along with the gradual improvement of the product the severity of such tests has increased. In the early years pats of neat cement were required to stand 28 days' immersion in water without disintegration. Some years later this requirement was replaced by the much severer steam test in which neat-cement pats were required to withstand 5 hr. of steaming without showing signs of distortion, cracking, checking, or disintegration. At the present time the steam test for soundness is a part of nearly all cement specifications.

Even before the development of a test for the accurate determination of free CaO in cement the cause of unsoundness was understood and properly attributed to the expansion of uncombined lime. Aging the clinker, adding water or steam to the mills while grinding the cement, or aerating or aging the cement were practical means of hydrating the free lime and overcoming unsoundness. In 1929 Lerch, after a comprehensive study of the cause of unsoundness, stated that the abnormal expansion which occurs when certain cements are subjected to the steam test is apparently to be attributed solely to the presence of free CaO. A further observation was that magnesia may be present in quantities greatly in excess of the present Standard Specification for Portland cement and not cause unsoundness as measured by the 5-hr. steam test. Thus, it is apparent that up to the present time, the problem of passing the 5-hr. steam test for soundness has been one of controlling free lime in the clinker.

The effect of magnesia in cement has been the subject of considerable study. Generally it has been regarded as a harmless adulterant when present in small percentages. When present in considerable quantity excessive expansion of specimens after long storage in water and disintegration in structures were observed. As a result, in the specifications of nearly all countries the magnesia in Portland cement is limited to 5 per cent.

In recent years the constitution of Portland-cement clinker has been quite definitely established and the characteristics and behavior of the various constituents determined. In the systematic study of cement definite information concerning the volume constancy of the individual compounds was revealed. These studies led to the subjection of cement specimens to severer conditions of temperature and pressure, resulting in the development of the present autoclave test. The testing of cement specimens subjected to elevated temperature and pressure is not new, but it has been in recent years only that the underlying cause and significance of the test have been fully understood.

Under the present 5-hr. steam test, free lime alone causes evidence of unsoundness, whereas under the severe conditions of the autoclave test unsoundness due to the presence of magnesia may be developed. Long-time volume-change observations on specimens have shown that high-magnesia cements often show excessive expansion. It is hoped that the autoclave test will be the means of indicating the long-time expansion of cement which may result from magnesia.

The expansion undergone by neat-cement bars when subjected to the autoclave test may be due to either free lime or magnesia or to a combination of the two. The amount of expansion contributed by each depends largely upon the physical characteristics of the clinker which are influenced by the burning temperature and the rate of cooling. Cements of identical oxide analyses may have widely-different compound compositions and vary greatly in expansion. The expansion contributed by each of the free lime and the MgO may be fairly closely determined. It is accomplished by determining the expansion of the freshly-ground cement, and then repeating the test on aerated samples of the same cement until a constant expansion value is obtained. The latter value is the expansion caused by MgO, while the difference between the final and the original expansion may be attributed to the free CaO. In the foregoing procedure it is assumed that the free CaO in the cement is completely hydrated or carbonated by exposure. Although this may generally be accomplished with most cements by exposure to laboratory air for a few days, with certain cements ground from hard-burned, over-limed clinker the hydration of all the free lime is much slower.

The same percentages of free CaO in different cements do not always produce the same degree of expansion. This is accounted for by the degree of burning and the density of the clinker. In cements made of porous, underburned clinker the free CaO is more accessible to water and is more fully hydrated before the cement sets, thereby reducing the expansive force. Increasing the fineness of cement also reduces expansion for the same reason.

In order to obtain duplicate results between different laboratories or in the same laboratory on different days on the same sample it is evident that the cement has to be kept in a sealed container and exposure reduced to the minimum. It is probable that in most plants the autoclave test will become routine procedure on daily production and shipment samples. In order to remove the variable caused by different degrees of exposure the practice of placing all samples immediately after collection in air-tight containers should be generally adopted. Due to additional exposure and aging it is to be expected that shipment samples will generally show lower expansion than the freshly-ground production samples.

Plants confronted with the problem of excessive autoclave expansion before selecting remedial measures should determine and consider the cause of the trouble, whether free CaO or high MgO or both. The conditions which result in high free CaO are generally well understood and the problem of its

(Continued on page 81.)

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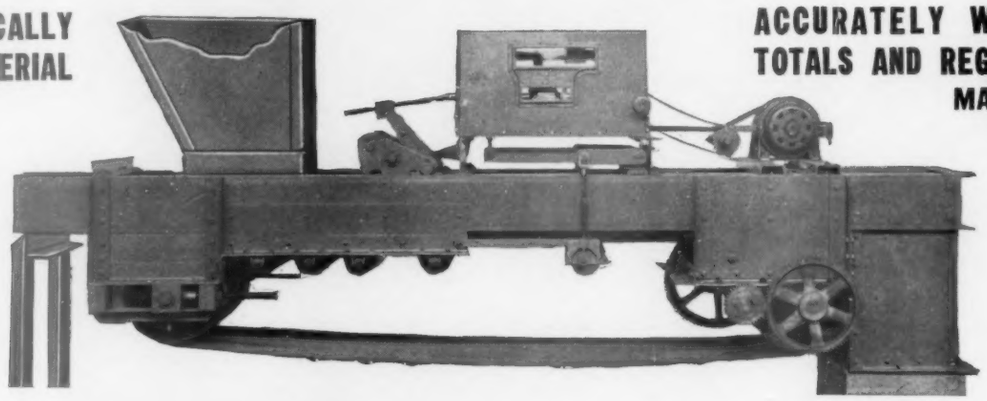

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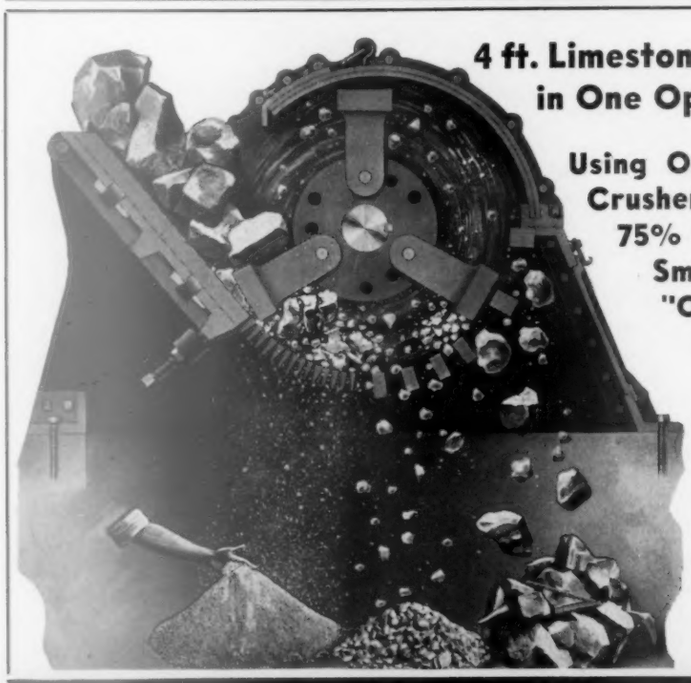

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Cover of the No. 7 "Mammoth" crusher. Special attention is directed to the large hopper opening.

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CRUSHER CHANGES AFFECT ENTIRE PLANT

Plant of Cumberland Portland Cement Co. Kiln building in center and crusher building in right background.

By W. E. TRAUFFER

AN article published in the October 1936 issue of PIT AND QUARRY described the installation of a Lee Process clinker cooler on one of the two 10-ft. by 150-ft. rotary kilns in the plant of the Cumberland Portland Cement Co. at Cowan, Tenn. This installation considerably improved the product of this kiln and resulted in important savings in production costs, in higher capacity, and in other benefits. Since that time another improvement, which has further increased the efficiency of the plant, was made. This was the installation in May, 1936 of a new hammer-mill secondary crusher to make possible more efficient and finer crushing of the limestone. The total power cost per barrel of cement produced has been reduced considerably by these changes.

The original crushing plant was completely described in an article published in the June 5, 1929 issue of PIT AND QUARRY shortly after it went into operation. The limestone is brought to the plant from the quarry in cars and is discharged from a trestle into the Allis-Chalmers primary gyratory crusher. This takes rock up to 36 in. in size and reduces it to 6 in. and under. An inclined belt-conveyor discharges the crusher product into a 60-ton steel feed bin in the secondary-crushing building. Formerly this conveyor discharged on a revolving grizzly which allowed only material over 1½ in. in size to go into this bin. The fines were by-passed around the secondary crushers. When the new hammer-mill was installed the grizzly was removed and all the rock now goes into the feed bin and the mill.

Feed end of grate-type cooler with drag-chain below.

A Jeffrey-Traylor 150-ton per hr. electric vibrating feeder discharges the stone from the feed bin into the new No. 5040 Dixie Machinery Co. Mogul hammer-mill. This crusher is reducing the 6-in. minus stone to ¾ in. and under at the rate of 125 tons per hr. With only one of the two kilns in operation this capacity is ample and requires the operation of the quarry and crushing plant on a 40-hr. week. According to Frank Pearson, superintendent, the feeder can easily handle 175 tons per hr. and the hammer-mill can produce almost double its present capacity. With both kilns in operation the quarry will probably be operated 60 hr. and the crushing plant 50 hr. per week to keep them supplied with stone. An original Allis-Chalmers Newhouse 10-in. secondary crusher has been retained and is held in reserve. This crusher is fed from the same bin feeding the hammer-mill and discharges its product by gravity into open storage. The product of the hammer-mill is discharged by a short pan-conveyor into the same storage.

The two Allis-Chalmers 2-compartment raw-grinding tube-mills are fed as before from this open storage. The only change made in these mills to adjust them to the finer feed is the use of 2-in. to 3½-in. steel balls in the first compartment in place of the 2-in. to 5-in. balls formerly used. The same 1¼-in. Concavex or 1-in. round balls are used in the second compartments. The weight of the total charge remains the same.

The hammer-mill secondary crusher with pan-conveyor below.

The feed to these mills averages about 79 per cent. stone and 21 per cent. clay slip. With the finer stone now made by the hammer-mill the capacity of these tube-mills has been increased about 20 per cent. The tube-mill product runs from 90 to 91 per cent. through 200-mesh, 3 to 4 per cent. finer than formerly. This finer-ground slurry has resulted in some increase in kiln capacity and the re-

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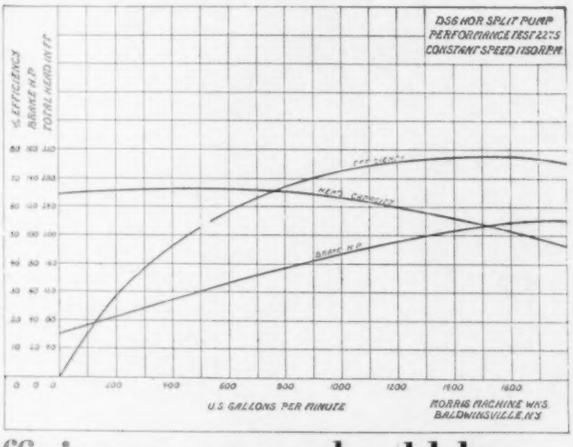

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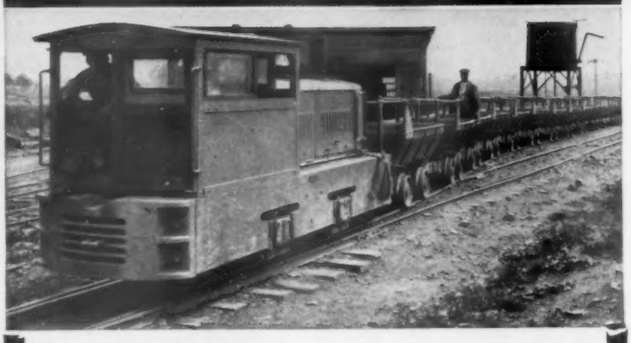

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sulting finer clinker has increased the efficiency and capacity of the finish-grinding tube-mills.

The Lee cooler has operated satisfactorily, according to Mr. Pearson, having increased the kiln capacity considerably and lowered the fuel con-

Another view of hammer-mill, showing electric vibrating feeder above.

sumption per barrel of output. The clinker produced has better grindability than formerly and this has increased the efficiency and capacity of the finish-grinding mills with a resulting lower cost of production. Another factor of importance in this plant, where efforts are made to keep the plant clean, is the elimination of the necessity for water-cooling the clinker. This process formerly created clouds of steam which combined with cement dust to form a thick coating on surrounding floors, walls and equipment, making it almost impossible to keep the plant clean. Also, through the use of this cooler it is no longer necessary to place the clinker in storage to cool and season and then to remove it to the finish-mill bins. Clinker is now fed to these mills as soon as discharged from the cooler.

Autoclave

(from page 7

following corrections: (1) higher raw-material fineness, (2) lowering of the lime content of the mix, (3) more uniform kiln feed, (4) lower kiln capacity, or (5) higher burning temperature.

If the autoclave expansion is largely caused by MgO, the problem may not be as easily solved. Plant experiences indicate that autoclave expansion caused by MgO may be reduced by the following methods and procedures: (1) increasing the raw-material fineness, (2) increasing the clinkering temperature to obtain a high percentage of liquid phase in clinker, (3) quench or cool the clinker rapidly from the maximum to below the temperature where any liquid remains, and (4) increase the iron-oxide content of clinker. The above conditions all lead to the formation of a higher "glass" content in the clinker. It has been definitely established through researches conducted by the Portland Cement Assn. Research Fellowship at the Bureau of Standards at Washington that MgO, when present in clinker as crystalline MgO (periclase), causes excessive expansion but that the same percentage of MgO, if in solid solution in the "glass" of the clinker, causes very little expansion in the autoclave test.

The making and testing of specimens and the routine operation of the autoclave should be readily mastered in most plant laboratories. Although the equipment is designed with a high factor of safety, in view of the high pressure at which it is operated, it is essential that the directions and details of operation be closely followed and the temperature and pressure frequently noted during the operating period. With a capacity of 8 specimens per day the apparatus has ample capacity for the daily routine tests of most plants, as well as the inclusion of special samples.

When the necessary precautions are taken in protecting cement samples from exposure, good agreement is had on duplicate tests. This is especially true when the order of the expansion is relatively low, less than .5 per cent. When the expansion is relatively great, duplication is not so good due largely to the warping and deformation of the bars.

The Working Committee on Volume Change and Soundness of Portland Cement of A. S. T. M. Committee C-1 is initiating an extensive co-operative series of autoclave tests. In this series of tests such variables as the percentage of mixing water in the neat-cement paste in making the specimen bars, the length of the bars, and various changes in the cycle of the test will be investigated. The results of this investigation will be a timely contribution and greatly enhance our knowledge concerning the autoclave test. Furthermore, the results may lead to a revision of some of the details in the present procedure of making the test.

Data showing the relation between autoclave expansion and the long-time performance of cement in structures is somewhat meager at the present time. That a definite relation does exist is a well-founded and rather generally accepted belief. More recent investigations at the P. C. A. Fellowship extending over a period of several years show a definite relation between autoclave expansion and the expansion undergone by specimens stored in water. The autoclave test, as employed at present, gives strong hopes of being the means of predicting the long-time expansion which some cements might undergo in actual usage.

May Develop Clay Industry in Tennessee

The possibilities of establishing a new light-weight clay product industry in Tennessee by use of the Porters Creek clay of West Tennessee are considered in a geologic-ceramic report issued from the offices of W. F. Pond, State Geologist. Laboratory researches by Geo. I. Whitlatch, assistant geologist of the State Division of Geology, indicate that this clay, which outcrops extensively through Henry, Carroll, Madison, Henderson, Chester, and Hardeman counties, fires into a product with at least one-fourth less weight than those made of ordinary types of clay. Units so light that they will float in water can be made by mixing the Porters Creek clay with small amounts of lignitic clays obtainable in the pottery-clay mines of West Tennessee.

The Porters Creek clay, a very abundant and accessible material, fires naturally, according to data presented in the report, over commercial ranges to a highly porous light-weight product. This unusual light-weight firing property, combined with the attractive fired color of the clay, makes it peculiarly adaptable to low-cost production. Present limited investigations indicate that the chief economic use of the Porters Creek clay will probably be in building materials, as brick and tile, with more limited application to acoustical tiles and refractory brick. Although Dr. Whitlatch's report frankly admits the need of considerable additional research to adapt the clay to commercial production, the data given warrant the belief that a light-weight product industry based on the Porters Creek clay can be established in West Tennessee.

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IN today's plant modernization programs, Dixie Mogul Non-Clog Hammermills are an important factor in increasing production efficiency. Here is a recent installation in the Cumberland Portland Cement Company's plant at Cowan, Tennessee, where extensive improvements have been made. The ruggedly built Dixie with its super-tough breaker plate . . . . 26 times the average wearing area . . . . is showing a record production and sensational low costs. D-I-X-I-E spells PROFITS on all crushing jobs.

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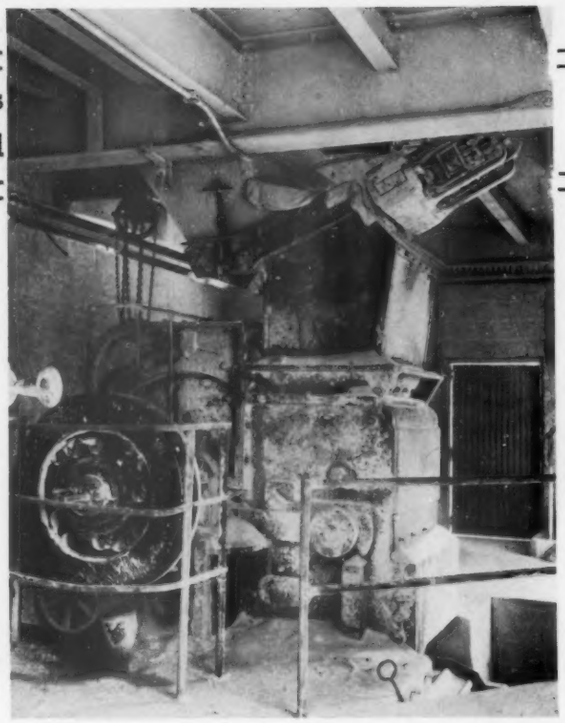

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Past, Present and Future of the Occupational-Disease Situation*

By C. O. SAPPINGTON, M. D.
Consulting Industrial Hygienist

YOU will recall in your high-school history courses that this study was divided into several parts, one pertaining to ancient history, one to medieval history and another to modern history. It will be rather convenient in presenting this review of the occupational disease situation to make comparisons between these kinds of history and the periods of evolution through which we have passed with regard to occupational-disease conceptions.

Our past experiences may well be compared to the period of ancient history and this period may also well be called the stage of guesswork and hysteria. Your interest and the interest of most people has been in the spectacular, and, in fact, this has been the basis for compensation laws in regard to mechanical injuries. There is nothing spectacular about occupational disease in the main and so your main interest has been in laws or in problems because people have continued to be crippled and killed by mechanical forces. There is no such direct appeal with regard to occupational disease. Then along came the depression with the effect of producing a number of spurious cases, which resulted in a great burden being placed upon industry in regard to the economic situation.

In addition to these factors there has been a lack of general knowledge and of trained men in the field of occupational-disease difficulties. All these factors have resulted in the production of bogies and unrest, hence the reason for applying the name of guesswork and hysteria to this period of evolution in occupational diseases as the stage.

Our present experience may well be likened to the period of medieval history. It is now believed that we have come somewhat past the bogy stage, with a swing to the factual and this stage may well be called the stage of reality. As evidence of the swing to the factual, last year occupational-disease compensation legislation was introduced in more than forty states and as a result of this activity a number of states have actually passed laws, including Illinois.

In this stage, when emphasis will be placed upon factual evidence, plant surveys and studies have become more popular; examinations, including X-rays and clinical laboratory tests, have now come into use more widely. These devices will be used more and more to get facts in this stage of reality.

The future, which overlaps somewhat upon the present and includes developments in the immediate offing, may well be likened to the period of modern history. This may be called the stage of progress. I predict that compensation for occupational-disease disability will be general in the United States within the next five years, that physical examinations will become universal within the next ten years, and along with this will be an increased use of surveys and studies of industrial environment.

As a practical outline of important sources of difficulty relating to occupational diseases, let us merely mention the following:

1. Dust (silica and asbestos-containing dusts).

2. Metals (lead, cadmium, chromium, mercury, thallium).

3. Gases (carbon monoxide, sulphur dioxide, hydrogen sulphide, arsine, the nitrous group, cyanogen compounds).

4. Vapors and solvents (benzol and its homologues, the chlorinated hydrocarbons, and others).

5. Skin irritants (soaps and cleansing powders, dyes, oils and greases, dusts and powders, solvents, agents of infection).

This is not in any way to be considered an exhaustive list, but a number of the "high points" of importance have been picked as the chief possibilities or probabilities relating to occupational disease and these have been mentioned.

It is significant in this connection that when the U. S. Public Health Service made a cross-sectional survey of industries and published its results in the year 1934, it was discovered that in order of frequency the chief exposures in industry were as follows: inorganic dusts, carbon monoxide, and lead. There are, of course, a number of others, but these are the chief types of exposure encountered in American industry and those which are likely to give difficulty. It is good to remember that this cross-sectional survey was made in ten different industries, embracing 615 plants and involving 28,000 employees.

It has been well said that the best criterion of an occupational-disease hazard is the occurrence of occupational disease; but none of us can afford to wait, I take it, for disease to occur. At this point it might be well to make a distinction between the two words *exposure* and *hazard*, simply because, as the U. S. Public Health Service has pointed out, if a man is exposed to lead, carbon monoxide or to inorganic dusts, it does not mean that he is exposed to a *hazard*. More must be known than the mere *fact of exposure;* we must know the quality and quantity of exposure and then, when compared with criteria which have already been established in the production of disease, we shall be able to say whether or not a *real hazard* exists. Remember that a hazard is always an exposure; an exposure is not always a hazard.

Here are some concrete suggestions which are boiled down to very brief expressions, but which contain the real essence of prevention of occupational disease:

1. Find out the *exposure* and the *hazard* in your plants.

2. Examine your men (before employment, during employment on hazardous jobs, and at the time of discontinuance of employment). The examinations will be different for different types of exposure; obviously an examination for a dust occupation will not suffice for a lead occupation.

3. Correlate cause and effect factors from the information gained by scientific study of the industrial environment and the medical data accruing from examinations and laboratory tests.

4. Control or eliminate the hazard, or furnish adequate protection for your men.

Another way of stating the above suggestions forcibly is as follows: *Management must know its men, materials, methods, and machines.*

In summary, the occupational-disease situation has become a national question; it involves socio-economic problems of tremendous significance; it presents difficulties no greater than any other industrial problem if the same amount of time, money and quality of brains are used, as have been applied in the past to similar industrial situations.

* Delivered before the Engineering Division, Greater Chicago Safety Council, Dec. 17, 1936.

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No material can be too hard or too abrasive to be economically handled in this new system!

The excellent principle of reverse current classification, within the Mill, is still maintained, no material passes through the fan!

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HARDINGE

A. S. T. M.

(from page 36)

of 1-3 to 1-2 of those of air-stored specimens, but at the later ages it is observed that the rate of flow is greater for the water-stored specimens than for the air-stored specimens.

The effect of water-cement ratio upon plastic flow is marked. The results up to the age of about two years show that between two concretes of equal cement content, the one having the higher water-cement ratio exhibits the largest flow. For example, the flow for a water-cement ratio of 0.7 was 50 per cent. greater than for a water-cement ratio of 0.6. For concretes having the same water-cement ratio, the richer mixes exhibit more flow than the leaner mixes, and the magnitude of the flow is directly proportional to the cement content. There appears the interesting possibility that the particle-size distribution of a cement, through its effect upon the structure of the hardened cement paste, may have an important influence upon the rate and magnitude of volume changes in general.

The results of two series of tests indicate that for certain cements, including low-heat and normal Portlands, the flow in tension is considerably greater than that in compression, at least up to the age of 6 months. It has been observed, however, that after a few weeks under load the rate of tensile flow may be less than the rate of compressive flow. This points to the possibility that flow in compression may in time equal or exceed that in tension.

The results of observations of plastic flow of mass-cured concretes made with a normal Portland and a low-heat Portland, each ground to the same surface area, show a marked effect of composition of cement upon plastic flow in compression. Up to 4 months the flow of the low-heat Portland is approximately double that of the normal Portland. In a further series of tests undertaken to study the effect of fineness of cement upon flow it has been observed that concrete containing coarsely ground low-heat Portland cement exhibited much the largest plastic flow at all ages.

Committee C-9 on Concrete and Concrete Aggregates submitted two proposed tentative standards which were approved, covering proposed Tentative Specifications for Lightweight Aggregate for Concrete and proposed Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine. The Specifications for Lightweight Aggregates have been developed in response to a need of some years standing for standardized requirements. In the specifications requirements are given covering grading, unit weight, mortar strength and soundness. The specifications indicate that "Lightweight aggregates shall consist of pumice, lava, tufa, slag, burned clay, cinders derived from the high-temperature combustion of coal or coke showing a loss on ignition of not more than 25 per cent. (40 per cent.) and volatile matter of not more than 5 per cent., or, subject to approval by the engineer, other material having strong, durable particles and conforming to the requirements of these specifications".

The new abrasion method using the Los Angeles machine is intended for determining the abrasive resistance of crushed rock, crushed slag, uncrushed gravel, and crushed gravel. This tentative method was prepared in cooperation with Committee D-4 on Road and Paving Materials to meet the need for a more accelerated abrasion test and one which would introduce the effect of impact more definitely.

This Fortieth Annual Meeting of the American Society for Testing Materials held at the Waldorf-Astoria, New York, June 28 to July 2, was an outstanding one in several respects. The registered attendance of members and visitors, exclusive of ladies, totaled 1,525, this being an all-time "high," compared with the previous high figure of 1,451 in 1931 and 1,131 for the 1936 meeting. Of particular significance is the fact that 52 proposed specifications and tests were accepted at the meeting for publication as tentative. This figure exceeds that of any other year and is an indication of the intensive work of the various society committees which developed the new tentative standards.

The Exhibit of Testing Apparatus and Related Equipment held in conjunction with the meeting was the most extensive one the society has sponsored. Many of the leading companies in the instruments and laboratory-supply field participated and a number of displays were arranged by society committees portraying features of their work and by certain institutional and research laboratories.

It was announced that the 1938 annual meeting would be held at Atlantic City. The 1938 Regional Meeting and Group Meetings of Committees will be held at Rochester, N. Y., during the week of March 7. It is expected that the technical feature of the Regional Meeting will be a Symposium on Plastics.

The formal opening session was featured by the annual address of the President, A. C. Fieldner, on the subject *Fuels of To-day and To-morrow*. He discussed the rise of petroleum, covering such topics as the search for oil, improvement of production, developments in refining petroleum and the displacement of coal by fuel oil.

After outlining the national fuel reserves, he discussed the fuels of to-morrow, indicating that gas, oil and coal are available to-day in abundance. There is coal enough for hundreds, and possibly thousands of years; but natural gas and oil obtainable by present methods may be exhausted in less than 100 years, and a shortage of our domestic supply may begin within 10 or 20 years. He indicated that coal will continue to be the principal fuel used for the generation of public utility and major industrial power. Technologic improvements and new hydroelectric power will tend to reduce the consumption of coal; on the other hand, an increasing demand for energy and a decreasing supply of cheap residual oil will increase the amount of coal consumed for power purposes. No material change is expected in either direction in the near future, but in 10 or 15 years the trend will favor an increased consumption of coal. To-morrow's power and central heating plant will burn any kind of coal completely and efficiently.

In discussing the motor fuel supply, one of the most interesting questions, he pointed to the prediction of Snider and Brooks that by 1945 there was the probability of considerable shortage of domestic petroleum. Doctor Fieldner said that from the very beginning of the automobile industry, recurring threats of shortage of gasoline were met in the field by finding new pools and improving production technique, and in the refinery by increasing yields and making a more efficient product. "The end has not been reached. We are just beginning to use scientific methods in extracting oil from the sands, and catalytic polymerization and hydrogenation eventually will furnish the means for complete conversion of volatile liquids and heavy petroleum to gasoline."

A. E. White, professor of metallurgical engineering, and director, Department of Engineering Research, University of Michigan, Ann Arbor, Mich., succeeded A. C. Fieldner as president; H. H. Morgan, manager, Rail and Track Fastenings Dept., Robert W. Hunt Co., Chicago, was chosen vice-president to serve with Dr. T. G. Delbridge, manager, Research and Development Dept., the Atlantic Refining Co., who became vice-president in 1936.

By ARNOLD KRUCKMAN

News and Views from the Capital

THE basing-point conflict has moved along another step. The Cast Iron Soil Pipe Assn. and its 35 individual members late in June filed a collective answer to the complaint issued by the Federal Trade Commission. This is regarded by V. P. Ahearn, executive secretary of the National Sand & Gravel Assn., as the "most important alleged Robinson-Patman Act violation, being that instituted against an industry using the the basing-point system, whereby all products are sold at delivered prices calculated upon a plant price at one city plus the freight rate from that city to destination, irrespective of origin of the shipment and the location of the consumer."

The defendants, or respondents in the language of the Federal Trade Commission, use Birmingham, Ala., as their basing-point. The commission charges that they comprise more than three-fourths numerically of the producers of cast-iron soil pipe in the country and actually manufacture more than 90 per cent. of all the pipe produced and sold in the United States. They are accused of maintaining a combination to restrict competition in the annual sale of 500,000 tons of pipe, of fixing prices, of coercing members of the industry to maintain the combination, and of artificially enhancing the price of pipe to the disadvantage of the ultimate consumer.

The law firm of Cravath, de Gersdorff, Swaine & Wood, New York, represent the soil-pipe people. This is one of the most notable international firm of lawyers in the United States. The answer sweepingly denies the jurisdiction of the Federal Trade Commission, and the acts of the Congress upon which the complaint is based. The answer denies that the soil-pipe producers are engaged in "commerce" as defined by the acts of the Congress under which the commission functions; and in discussing various details of the complaint the answer specifically reserves the right to move for the dismissal of the complaint. This means, of course, that the defendants intend to fight the cause to the last ditch, upon every ground available, and that they will take the case to the Supreme Court of the United States. It is expected this test of the Robinson-Patman Act will be a fine-toothed combing of every implication of the law. Aside from a legal scrutiny of the basing-point practice it is expected it will determine broadly the limitations of the application of the Robinson-Patman Act, the Clayton Act, and the Federal Trade Commission Act, so far as these laws affect competitive trade practices. Long-headed lawyers in Washington prognosticate that this litigation will have a profound effect upon the economic history of the United States, and will go down in the history books as one of the turning-points of United States law.

Meanwhile the act proposed by Senator Wheeler to abolish the basing-point practice is held up in the committee. It was originally intended that it should become law during this session. But that was the hopeful situation before Senator Wheeler became one of the leaders of the opposition to the court-reorganization plan. There is scant prospect now that the bill will reach the floor of the Senate.[1]

June 19 was the first birthday of the Robinson-Patman Act. The Federal Trade Commission announced that it had during the period investigated 291 cases, including 36 different types of industries and businesses scattered all over the United States. The 152 cases completed resulted in 22 so-called complaints, which in other branches of judicial proceedings are known as "prosecutions." Of the other 139 investigations, 32 cases are still awaiting final disposition, meaning that the commission has not yet made up its mind whether to prosecute or to abandon. The other 107 cases have been abandoned for some reason or other.

The commission says that the 291 cases it has investigated represent only a small part of the cases handled under the Robinson-Patman Act. The actual transactions are informally said to run into thousands. The commission declares that informal counsel given to business men and lawyers prompted whole industries to revise quantity discounts and inequitable allowances and other discriminations.

In Pennsylvania, as probably in other states, the effect of this and other laws prompted by the Robinson-Patman Act has been much more drastic. It is reliably reported that over 400 A & P chain stores have closed in Pennsylvania, and that out of a total of 11,000 chain stores of all kinds in that state, 4,000 will be closed by the end of July. This action is said to affect, directly or indirectly, the employment of 35,000 persons.

The Congress, however, has proceeded to enlarge the powers of the Federal Trade Commission. The Senate passed the Wheeler bill, S. 1077, known in the House as the Lea bill, and all signs portend that it will have passed the House and be law by the time this is published. It amends the Federal Trade Commission Act, gives the commission extraordinary inquisitorial powers, widely extends its powers in all directions, particularly to the extent of removing the necessity of proving competition in its policing of trade practices. It legitimizes its trade-practice conferences which heretofore have been called without any warrant in law. The amendment gives the commission the power to prosecute, and to enforce its findings, on the broad suspicion of deception. Also it is given wide powers to censor advertising, especially food and drug advertising; and the proposed law is construed in some quarters as giving the commission powers to prosecute newspapers, periodicals and publishers of books, if the text, in the opinion of the commission, is deceptive. The police powers bestowed by these amendments are so extensive that it would be wise for every business man to write his congressional friends to send him a copy of the bill in order that he may study its details.

In order further to clarify congressional — or executive — control over business and industry the program is to provide an additional bill which, in its effect, will be as broad and comprehensive in relation to trade practices as the Black-Connery bill is to labor practices. This bill is being composed by the liberal group advising the President. The purpose is to give the Federal Trade Commission further powers to regulate industry. The inspiration for this additional bill is the suggestion that the control over labor practices should be split away from the control over trade practices. It is felt that this separation will strengthen both, and avoid the legal weakness that was inherent in the basis for the N.R.A.

The President continues to insist that the Black-Connery wage-hours

[1] See p. 29 for report of action taken against the cement industry.—ED.

bill must be passed as it was written by Messrs. Cohen and Corcoran. In public at least the Joint Committee leaders support the President. But the Congress as a whole is rather reluctant to rush it through as originally scheduled. The members of both houses have heard from their friends back home, and, it is said, there has been a surprising opposition to the bill from farmers and people in the rural districts. The overwhelming powers bestowed upon the Labor Standards Board has been protested from many quarters. The obviously-valid objections to a multiplicity of the provisions of the bill has made plain that the matter of legislating maximum hours and minimum wages is not as simple as it first appeared. And the members of the Congress realize now that hours and wages are minor considerations in comparison with other implicit effects of the bill upon the destiny of all American business and industry. The suggestions[2] submitted to the Joint Committee by Charles Warner, president of the Warner Co., of Philadelphia, representing the viewpoint of the pit and quarry industry, and of George H. Davis, of Kansas City, president of the Chamber of Commerce of the United States, made a deep impression upon the legislators. These representatives of industry and business were among the very few who were not ruthlessly badgered by those in favor of the bill. Incidentally, the attacks to which persons appearing at recent hearings have been subjected have apparently produced such an unfavorable effect upon the country at large that the Joint Committee abandoned those tactics after starting out with the apparent purpose of ridiculing all witnesses opposed to the bill. Anticipation of such treatment at the hands of committee members caused many business men to send word that they would not appear and expose themselves to what they felt were unwarranted indignities. There is so much feeling about this growing tendency in congressional hearings that many members of the Congress themselves are discussing ways and means to protect the witness. It was evident to the committee that summoned Tom Girdler, chairman of the Republic Steel Co., that the audience enjoyed Girdler's sturdy riposte to the committee's bludgeoning.

The obviously complex nature of the Black-Connery bill has caused the majority of the members of the Congress to hail with approval Senator Walsh's suggestion that a commission should be appointed to study all phases of the proposal among every element affected, including the consumer, in all parts of the United States. The suggestion is that the commission shall visit all sections, and after thorough first-hand study and deliberation report its findings and conclusions with recommendations to the next session of the Congress.

There is every likelihood that this suggestion, in substance, may be adopted, especially if members of the business and industrial community throughout the United States take the trouble to inform their representatives in the Congress about their ideas and viewpoints. This much-bedeviled Congress will very sincerely appreciate every genuine manifestation of personal interest by those who represent substantial influence in their districts. Business men who can spare the time to visit Washington should come here; and a telephone conversation will be more effective than a telegram or a letter. But a telegram or a letter is infinitely more effective than absolute silence, at this time when the future of business and industry seems to be at stake.

The National Labor Relations Board celebrated its second birthday on July 5. Since its origin the board has handled over 5,000 cases involving over 1,000,000 workers. It is estimated that the cases settled, which included reinstatement of strikers with back pay during the period of the various strikes, cost the employers collectively approximately $250,000. These orders of the board requiring employers to reimburse employees for the time lost while on strike are regarded as among the most effective weapons of the new board. It is supposed to cause many employers to hesitate before risking the hazards of a strike.

The board holds in a recent ruling that if you conduct what may legally be construed as a business which is "in the flow of interstate commerce," you may not move from one part of the country to another in order to settle in a region which will give you the advantage of a cheaper supply of labor. If you move, rules the board, you must take your help along, and pay all their expenses, including traveling and moving expenses of household goods, and members of the families, and all other expenses that may be caused by the transfer. You must also pay their wages while they are moving.

This was the ruling in the case of the S & K Knee Pants Co., Inc., of Lynchburg, Va., manufacturer of low-priced men's clothing. After strike troubles this concern prepared to move to Culpeper, Va., a non-union area. The board, after imposing the obligation to pay all arrears of wages during the strike, ordered that the employees be given jobs at Culpeper, and be transported with their families to Culpeper at the company's expense. The principle would, of course, be the same if the company moved to Alaska.

The Wagner Act, under which the National Labor Relations Board functions, requires that the first step of workers with a grievance shall be an appeal for an election to determine which union represents a majority and shall conduct the collective bargaining with the employers. The U. S. Circuit Court of Appeals at Philadelphia ruled against the strikers in the Apex Hosiery Company's mills because they walked out before making such an appeal to the board. It also held that the workers violated the Sherman Anti-Trust Act in interfering with interstate commerce. The second ruling, in effect, makes unions responsible exactly as employers are responsible.

The striking aspect of this case however is the fact that the workers in the Apex mills acted exactly as did the strikers involved in the Inland, Republic, Bethlehem Steel and Youngstown Sheet & Tube company troubles. The steel strikers walked out and declared they would ask the National Labor Relations Board for an election to determine who should do the collective bargaining *after* the issue over the form of the contract had been settled with the companies. It was understood in Washington that the C. I. O. leaders who arranged the strike had frankly admitted that they doubted whether or not the C. I. O. actually represented a majority. They expected, however, that a successful demonstration would repair that uncertainty.

Despite the failure of the C. I. O. people to initiate proceedings as prescribed by the Wagner Act, the National Labor Relations Board acted upon other charges filed by the C. I. O., and cited the steel group for refusing to sign an agreement. The Wagner Act specifically omits the requirement of a signed agreement, and the National Labor Relations Board in an earlier action ruled that no legal obligation rested on an employer to accede to the demands of his workers; in other words, to make an agreement that he sincerely felt to be unfair. In the Jones & Laughlin case the Supreme Court ruled that an agreement was not mandatory as the consequence of collective bargaining. The sole point in the steel strike was the refusal of the employers to sign a contract. There was no difference about wages and hours, the companies having been ready to pay workers the standard wages and work them standard hours,

[2]See p. 91 for Mr. Warner's statement.—Ed.

yet unwilling to sign a contract which is an act not mandatory under the law, there is much question here how the National Labor Relations Board will maintain its implied demand that the companies sign a contract which the companies, apparently in all sincerity, do not consider a fair practice. Without doubt the question will go to the Supreme Court.

Like the rest of the country, even Washington feels that the C. I. O. has lost prestige and advantage in the steel strike. The proceeding is considered inexplicable except as a poorly conceived method of applying pressure for the swift enactment of the wage-and-hours bill, and as an economic artifice of pressure in a competitive fight between industrial units.

It being clear that practically all the issues pending in Washington must eventually go to the Supreme Court for final arbitration it may readily be understood why the court-reorganization bill remains the key of the Administration program. Whatever you may hear or read about the President's attitude toward the court bill, you may depend upon it that he hopes to have it passed as originally written. If a compromise is finally inevitable, he will work for the minimum concession. And it is more than possible that the bill will pass essentially as he wishes it to become law.

Representative Hartley (New Jersey) has filed H. R. 7272, proposing a system of licensing which would impose the usual hours-wages-labor-practices regulations, but also requiring all labor organizations to be licensed by the Federal Trade Commission. Under this bill labor unions would be obliged to file financial statements, copies of charters, articles of association, and by-laws; and if a union should use coercion, intimidation, violence, or threats and if it should destroy property or break agreements, or exert force in any form in any strike, the license could be revoked.

H. R. 7371, introduced by Representative Eicher (Iowa) prohibits the acquisition, directly or indirectly, of the stock of a competing corporation, so as to give the purchaser control. Senator Wagner's Low-Cost Housing bill, S. 1685, has been marked by the President as one of his desirable measures. It would create the U. S. Housing Authority empowered to issue $1,000,000,000 worth of bonds within four years in about equal instalments. The bonds would be fully guaranteed by the government. The money would be lent to states, counties and municipalities to provide low-cost housing. Repayment would be distributed over 60 years. The bill also provides for an outright appropriation of $50,000,000. It has the support of the A. F. of L. as a make-work project.

S. 2336, Senator Walsh, authorizes public works to be constructed by the navy; radio station and airfleet shop buildings at Hawaii; submarine training school buildings and barracks, New London, Conn.; works and buildings at Annapolis; buildings and works at Mare Island, San Diego and Oakland, Cal.

H. R. 7235, Representative Johnson (West Virginia) provides $5,000,000 for levees, sea walls and other works, at Huntington, W. Va.

H. R. 7051, Representative Mansfield (Texas) appropriates funds for 119 river and harbor improvements in 26 different states and authorizes preliminary surveys of 111 projects in 26 states. The bill places a number of projects under the Secretary of Interior as well as under the Secretary of War.

H. R. 7456, Representative Ramsay (West Virginia) provides that the practices listed in the tax investigation shall, in the future, be construed as fraudulent. The investigation is considered as a boomerang in Washington because it has exposed what seem to be weaknesses in the Bureau of Internal Revenue of the Treasury Department. It has now developed that the methods of tax-saving that have been criticized in the committee hearings have been in use since 1929, and that the Bureau of Internal Revenue has been aware of the practices since the beginning. It has also developed that insurance practices which have aroused the greatest comment were revealed to the bureau by Charles Evans Hughes, Jr., son of the chief justice. Members of the Congress feel that the revelations have been more in the nature of a demonstration for the necessity of reformations in the Treasury Department than of the iniquities of tax-evaders.

H. R. 7023, Representative Coffee (Washington) would create the "National Natural Resources Law," prohibiting after 18 months the operation of the coal, electrical energy, oil, and natural gas industries as private enterprises. The National Natural Resources Corporation, with $100,000,000 capital, would operate the industries as a nonprofit national unified system. By paying a fair value the corporation would secure control of all such private industries either by negotiation or by eminent domain. The corporation would be managed by a board of five directors working in co-operation with a joint committee of the Congress. The board would be empowered to close surplus mines and plants, create retail selling agencies, and fix retail prices.

H. R. 6974, Representative Havenner (California) provides $7,516,000 for the construction of buildings and utilities at the Presidio, San Francisco, California.

H. R. 7079, Representative Snyder (Pennsylvania) directs the Department of Interior, in co-operation with the Bureau of Public Roads, army engineers and state highway departments, to build three transcontinental highways and six north-south highways, with a system of airports tangent to the intersections of the highways. Each highway would be 60 to 100 ft. wide, lighted at night, and the contracts would be let to the lowest bidders for construction in units of not less than 10 mi. The roads would be finished in 1954 at an expense of $8,000,000,000.

The most persistent and repeated suggestion afloat in Washington concerning the probable appointee for the vacancy on the Supreme Court bench is connected with the name of Lloyd K. Garrison. He is a young man, one of the original New Dealers, and apparently is still in the good graces of the President and the group which has most influence with him.

North Dakota Filter Clay Deposits Being Explored

Commercial development of the clay deposits of Cavalier County, North Dakota, is expected to follow the leasing of lands in Olga and Beaulieu counties by G. Austin Schroter of the Filtrol Corp. The lease allows three months for exploration work, and then runs for 20 years after that.

Considerable work in investigating the fuller's earth deposits of Cavalier County has been done by Prof. William Budge of the University of North Dakota. A field project to explore the section is to be financed through WPA funds.

Pennsylvania Shares Cost of Liming Farm Soil

Lime was spread over 137,049 acres of Pennsylvania farmland last year by farmers co-operating with the federal government's soil conservation program, the State Conservation Committee, Harrisburg, Pa., announces.

Sharing a part of the cost, the conservation administration instituted the liming program in this state in an effort to restore thousands of acres for root vegetable crops. In northeastern United States co-operating farmers have limed 339,000 acres, the committee reports.

Leaders in the Industry Tell Their Views on

THE FUTURE OF LABOR RELATIONS

A FEW months ago I would have said that the unionization of the aggregate industry in Indiana and Illinois was imminent, especially since the contracting industry has been organized very recently in these states. However, within the past month or six weeks it appears that the idea to organize workers wholesale has lost ground, perhaps on account of aroused public opinion due to the tactics that have been employed rather than from any general antagonism to properly-conducted unions.

I believe I have a very receptive and perhaps favorable attitude toward unionization in the aggregate industry, provided it can be accomplished in a manner that will actually benefit the workers and that the industry can carry the burden of any increased costs that might develop therefrom.

On account of the fact that the average aggregate producer is in close touch with his employees and knows their needs and in many instances their personal problems, I do not believe that unionization would improve the relation that now exists.

Unionization seemingly has for its prime object an increase in pay. It is believed by many that if prices on building materals are further advanced, it will discourage the development of construction work which for the last year has been on the ascendency and it is doubtful whether those who have plans in prospect will be willing to go ahead if building costs are increased. In that event the workers, as well as the producers directly concerned, would suffer by loss of business and nothing would be contributed toward the improvement of the general economic situation.

On account of the nature of the aggregate business it is my opinion that the vertical type of union would be best suited to our industry but I am far from being in sympathy with the leaders of that type of union at the present time. I am inclined to believe that a modified type of the horizontal union will ultimately predominate and it may be that our industry would lend itself to that adaptation.

I believe that most employers, including those of our industry, have a sincere interest in the welfare of their employees irrespective of any pressure that might be brought to bear through legal or other means.

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Because of the rapidly-moving panorama in the realm of employer-employee relations, PIT AND QUARRY has asked a number of the industry's leaders to state, anonymously of course, their views on the broad scope of the labor question. This symposium is the result. Published herewith, they give the reader a cross-section of opinion on the subjects of unionization, types of unions, effect of the changing labor picture on the industry in general, and the question of working hours and wage rates. Additional letters will be published next month.—Editor.

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It is apparent that each industry has its own economic problems, the solution of which is not of general application. In our case, because of the seasonal nature of the business, it would be highly impracticable, if not impossible, to provide continuous employment, and it is extremely doubtful whether the purchasers of our material can absorb the increased cost that would be incurred if wages were raised sufficiently to provide a full year's living expenses for six or seven months' work. This leaves only one expedient for the men, that is, to supplement the wages which they receive from employment in our industry by other pursuits, either farming, raising garden-truck or finding temporary employment during the off season. The suggestion that employers and employees make a common study and co-operate in an effort to work out a solution of the problem is worthy of consideration.

I believe emphatically that when possible wages should be sufficient to provide a high standard of living, including not only the necessities but the rightful luxuries of life; provision should also be made for unforseen exigencies and a competence for years when earning power has declined. It seems to me that increased purchasing power of the general public will benefit all business irrespective of the commodities directly purchased for there is an interrelation between business activities such that one branch can not be either favorably or adversely affected without a like result to other branches.

As I view it, the regulation of hours of work depends entirely upon the character of the operation under consideration. The aggregate producers can not anticipate the daily demands for their products either in grade or quality; moreover, the industry does not lend itself readily to production in advance of delivery or, in other words, to extended storage. For this reason it is impracticable to operate on a fixed schedule of hours for each and every day, though a maximum number of hours a week might be adhered to without serious difficulty.

If advances in wages and shortening of hours of work increase the cost of production beyond the ability of the industry to absorb it, advantage may have to be taken of all technological ingenuity in order to reduce costs. This probably will not improve the economic situation for the workers nor prove desirable for the public at large since it will tend to reduce purchasing power. Vicious circles of economic harm must be avoided for the general good. There is a limit beyond which labor-saving machinery leads to economic betterment for either employers or employees. The first result, of course, is either to reduce the number of men employed or to shorten the number of hours worked. There seems to be no practical way to give the laborers the benefit of any saving that thus might be effected, otherwise the producer would not be justified in making heavy investments in labor-saving equipment.

(Gravel)

* * *

Unquestionably there is an increase in the unionization of workers generally and this increased movement has already been projected into the quarry industry. Unionization of workers in the better-managed plants can not greatly aid the workers, as most suc-

cessful employers are already quite willing to pay labor as liberally and grant as favorable working conditions as the situation allows. It is impossible for labor, either in its own behalf or through union representatives, to secure more compensation from an industry than that industry can pay. Many of the deplorable conditions as to low wages and poor working conditions exist in the more isolated and rural communities, which communities will probably not be unionized since labor is not present there in sufficient numbers to attract the union organizer.

You speak of preference between industrial unions. If by the word "preference" you mean which type of union is the most effective from a union standpoint, it would be my opinion that the vertical type would win such distinction. Certainly the vertical union gives evidence at the present time of being more effective than the long-established trade or craft union.

With reference to your statement that the "vertical type includes all the workers in a given industry", it is my understanding that while this is perhaps the ultimate objective, unionization is at the present time more or less limited to individual industrial plants rather than to whole industries. Were all workers in a given industry included in one union organization the inequalities arising from partial unionization would then be eliminated from that industry. Under present plans if a vertical union is established in one plant of an industry and other competitive plants are not so unionized, the first plant might be at a distinct disadvantage as far as wages, hours and working conditions are concerned.

With the federal and state governments taking Social Security steps such as old-age pensions and unemployment insurance, it would seem that for industry to be required, either by law or otherwise, to provide similar protection would result in duplication. To-day without being so required by law many industrial concerns take an interest in the economic situation of their workers. This is reflected in as liberal a wage as competitive conditions will allow, in a generous attitude on the part of management to labor in the case of sickness, etc., and in the retaining of employees long after the worker's most productive period has passed. These present practices could be supplemented (as you suggest) by attempts at re-arrangement of production to reduce or eliminate irregularities in the production schedule. In the quarry industry, however, this is exceedingly difficult; particularly in those climates where temperature changes create "peaks" and dips in construction work. Since such a large portion of the cost of producing stone is labor and other items requiring cash outlay, it would require an exceptional amount of capital to run continuously throughout the year accumulating in the off-season sufficient stone to be marketed during the construction season. Stone when placed in storage quickly accumulates dust and dirt, often requiring rescreening, adding further difficulty. The inability of management to forecast the requirements for each of the several commercial sizes of stone required would also complicate matters. For the above reasons I do not believe that the quarry business can be operated on an even keel the year around.

It is my further belief that the quarry business can not raise wages sufficiently to provide a full year's compensation for a brief season of labor. Some of the less resourceful and less capable employees find it necessary to accept unemployment during the off-season; whereas many others find it possible to adjust their off-season unemployment by securing temporary employment elsewhere. In those quarries producing stone for manufacturing purposes the off-season is very much less severe and the irregularities in employment constitute much less of a problem for the workers.

Generally speaking, any step taken to procure for American workers a higher standard of living has a strong appeal, but I am unable to judge the effect of the increased public purchasing power on the economic health of the country. I am not sure that the placing of a limit on the hours of work is proper. Many, perhaps even most, people seemingly accept the fact that sharing work through limiting the hours of labor to be performed by any one man offers the best solution to our unemployment problem. To me, however, it continues to seem logical that a man should be permitted to work as many hours as he chooses with the greater wages resulting from such extra work being passed on to others, through purchases, thereby creating employment for others.

Physical wealth is created only by work and if the result of a full week's labor is to be divided between two men, it must follow that the wealth so created must also be shared by both, thereby reducing the amount available to each.
(Crushed Stone)

* * *

I feel that unionization of our workers will come and I am fearful that it will affect our relations for the worse. In a small organization such as ours we work very closely with our men and enjoy a very pleasant relationship, but under unionization I fear that these relations will be adversely affected. I do not feel that the economic status of our workers will be benefited under unionization.

I think our preference would be for an industrial union of the so-called vertical type, but I realize that most of the building industry at present is of the opposite type or craft union. I have heard of an instance where a producer in the sand-and-gravel business signed an agreement with the C. I. O. and then was boycotted by the craft union who would not use his material when supplied on the work on which their members were engaged. Our preference for the industrial union is based largely on the fact that it would avoid having an industry shut down because a certain small group essential to the general operation was dissatisfied and went on strike.

I believe that we should be concerned about the economic situation of the workers. In a seasonal industry it is very difficult to provide steady employment. In our slag business our operations are quite steady due to the fact that we process the slag largely as produced daily by the blast-furnaces. However, our operation is largely in the open, that is, the storing of crushed and screened products through the winter requires operating over a large area exposed to the weather. This would also be the case in the stone industry and the sand-and-gravel industry, if they should try to spread their production over twelve months. Particularly where washing operations are required it would be practically impossible to operate in the winter months, particularly in the northern states where freezing weather is bad.

I believe that wages should be greater than the cost of supporting the workers and their dependents. Certainly such a scale of compensation would not be satisfactory to me personally, and therefore I do not see why it should be satisfactory to the workers.

I am in favor of regulating the hours of work because I believe past experience has shown that too long hours have been permitted. However, I am opposed to having the hours so short that a great amount of leisure time is afforded at a time when people do not know how to use it. I believe we are all in need of considerable education on the matter of the use of leisure time.
(Slag)

Regulating Hours in The Aggregates Industry

By CHARLES WARNER

President,
Warner Company, Philadelphia

To the Joint Committee of the Congress on the Black-Connery Bills to establish fair labor standards, etc.:

This statement was prepared and presented by Mr. Warner to the Joint Committee of the Congress which is considering the Black-Connery bills proposing the regulation of hours and wages and fixing other labor standards.—Editor.

THE constitutional and general aspect of this proposed legislation will not be commented upon by me as these angles have been quite fully covered by others, but I do wish to place on the record a few of the important operating problems which some of the major industries have to encounter, in the hope that your committee will appreciate the extent of the individual problems that will be thrown on the new board to investigate and properly apply adjusted rulings that undue hardship may not be suffered by both employers and employees. There are many operating practices that can be approved and that will make for less costly operation without an oppressive work week, hence helping to reduce the necessity for advancing commodity prices with the broader hardships that result therefrom.

My life's work has had to do with the development and management of companies engaged in the manufacture, transportation, and retail distribution of sand, gravel, crushed stone, ready-mixed concrete, and lime products. The production of sand, gravel, and crushed stone must change materially from week to week because of seasonal demands, fluctuations in "peak"-load requirements and adverse weather conditions. These materials in their prepared form sell at very low prices, ranging from 40 to 80c. per ton at the plants; such prices do not admit of double handling on any large-scale basis into stocks and out again. As construction work gradually gets under way in the spring the business of a plant unit may build up to enough shipments to take care of a 40-hr. per-week shift. Then a further step-up in demand requires an output of about 50 hr. per week for such a unit. Our regular employees, sufficient for one shift, insist on these 50-hr. weeks on a single-shift basis so as to offset the shorter working weeks during winter seasons or bad weather conditions.

Unless it is the intent of these bills to have the new board definitely permit such leaway above 40 hr. a situation of this kind could only be met by organizing a second shift and throwing the regular crew on 25 hr. a week with the reduced weekly income per man resulting therefrom. We have found this creates great dissatisfaction among our regular year-around employees, who recognize the fluctuations in the business and want through the year some weeks of 50 hr. to balance up the year's income.

The low selling prices for such bulky materials do not allow minimum weekly wages based on an hourly rate for 40 hr. to meet such a condition. When such a plant unit has to step up to 60 hr. of operation a week, as the spring business further expands, it is not so much of a hardship temporarily to place the regular employees on a 30-hr. shift, with the new crew taking the other 30 hr.; this situation is, therefore, more practicable.

One important branch of the sand-and-gravel industry faces even more severe operating conditions. It dredges materials from navigable waters and transports them from the point of dredging to the point of distribution by scows and tugs. Such operations are faced with conditions that do not exist for the operator of a land plant. They are subject to serious interruptions by weather conditions, tides, fogs, locks, high and low water, ice and other factors too numerous to mention.

Employees on a large proportion of these vessels are housed and fed aboard; the very nature of the operations is such as to make this necessary. The housing is available for only two crews and in no case so far as I have been able to determine for more than two full crews. Whatever housing is available is designed and built as an integral part of the vessel. In practically no case, as any marine engineer can testify, would it be feasible to increase housing facilities without rebuilding the boat in a large measure.

Under these circumstances it should be obvious that the application of a limited work week is entirely impractical.

In the manufacture of lime we have a different problem in that the operation of kilns requires continuous attention for the full 168 hr. in a week. Four crews operating on a week's run, with 8-hr. shifts and a limit of 40 hr. per week, only provide for 160 hr. out of a total of 168 hr. There are 8 hr. missing. If we try to divide the work among five shifts it reduces the work-week hours and the week's pay per man, and the employees are dissatisfied. In relatively-small rural plants of this type it is oftentimes not possible to have an extra crew only to handle one 8-hr. shift in a week, so that four regular crews can secure 40 hrs. per week of work.

After exhaustive trials of this problem under the N.R.A. our kiln operations at our various plants have been satisfactorily worked out so that four crews handle the week's work and one of these crews takes an extra 8-hr. shift or 48 hr. a week, each week in rotation. Thereby each crew has to handle an extra shift only once every month. We have found in practice that these adjustments are not injurious to our employees either physically or mentally, and that they do aid our regular forces to secure more satisfactory year-around incomes while working in these low-price, basic-commodity industries, which yield but moderate profit when at capacity operation.

The packing, shipping, and retail distribution of many of these products are subject to extreme fluctuations by reason of great variations in seasonal demand and interference by weather conditions.

Agricultural lime products are subject to extreme seasonal demands due to the short liming periods that are practical, on account of weather conditions and times of planting and harvesting. In this department we have to pack and ship over 80 per cent. of our year's output within the periods of six spring weeks and four fall weeks, a total of two and one-half months. In the rural communities, where such plants are located, as a rule there is

not an excess of reliable, semi-skilled workmen, and if we should be required to employ a sufficient number of men for the rush seasons to keep within a 40-hr. week, during off seasons of seven or eight months we should not have sufficient work to employ these men for an average of even 10 hr. per week. It must be obvious that to average up with adequate annual employment and income for such rural workers much longer hours are necessary at reasonable rates of pay during the short, highly-seasonal periods. As a matter of fact, the demand is constantly upon us from our employees in these classes to provide them with the longer hours during the rush season, for the purpose of augmenting their annual income; and this condition is offset by relatively-easier hours of service, providing time for personal work around their homesteads during the off-shipping seasons.

Under such conditions we do not believe that for a few weeks a work-week of 60 to 65 hr. constitutes an oppressive condition any more so than in agricultural work, and the general good health of our workmen indicates that this situation is not injurious to their physical or mental welfare.

The extent to which such variations can be permitted without an oppressive work week is left to the proposed Labor Standards Board, but we trust nothing will be inserted in the final draft of the bills which will restrict the authority of your new board to the extent that agricultural lime shipments will be retarded and the costs substantially increased when the farmers need such materials for quick and cheap delivery.

In our retail building-material yards bulk and bagged building materials are handled and delivered by trucks to the construction jobs. In addition, the modern practice of fabricating and delivering ready-mixed concrete has increased largely. Most unionized construction jobs operate on an 8-hr.-day basis when the weather allows, but the building-material yards servicing such construction work are frequently pushed to 10 and 11 hr. of work a day in order properly to take care of the 8-hr. customers. Loading and deliveries must start at the yards upwards of an hour before the starting time at the jobs, and at the end of the day the trucks and other yard work incident thereto are not returned and properly cared for for at least an hour after the construction job closes down. The average building-material yard therefore finds it necessary to operate during good-weather weeks as high as 50 hr. a week in order to take care of its 40-hr. customers. Particularly in the handling of ready-mixed concrete, a perishable material with but one hour of life from the time of fabrication to the time of placing in the forms at the point of delivery, do we find a highly-troublesome manufacturing and delivery problem.

A typical "peak" summer month in the Philadelphia yards of my company has shown a daily average of concrete mixing and delivering of 5,000 tons, with two "peak" days demanding 6,500 tons each, 130 per cent. of the average. Low days showed 1,600 tons each, only 30 per cent. of the average. This shows the fluctuation in demand and the problem in maintaining semi-skilled labor forces on a reasonable working week while at the same time guaranteeing to these men a minimum of 40 hr. work per week, as provided for in some union contracts.

In these cases our union agreements have recognized the problem by maintaining the standard hour rates up to 48 or 50 hr. per week, and time-and-a-half rates in excess of such weekly schedules to meet the occasional need of even longer weeks if good weather and contractors' demands require it temporarily. Again I would like to state that these conditions do not produce oppressive overwork in the occasional high weeks, and the employment is regulated to keep between the 40-hr. minimum and the 50-hr. maximum to avoid the payment of overtime rates or payment for idle time.

I give you these several illustrations of working problems with which I am intimately connected that you may see the importance of incorporating flexibility in the law, as well as reasonable assurances that the policy back of the new law will definitely require that the proposed Labor Standards Board meet such conditions by careful investigations and open hearings before the issuance of suitable and reasonable regulations.

It must also be apparent from these several illustrations that if the earnings of employees are not to be seriously curtailed in the type of industry with which I am identified, the Labor Standards Board must have sufficient discretion to adjust the congressional standard to the peculiar operating problem of the various industries with which it must contend. To develop intelligent standards for each line of business entails a problem of the first magnitude for the new board and ample time must be allowed for its careful handling.

As I understand the wording of your bill, Sec. 13, there is no positive authority extended to employers to file complaints or requests for investigations of such problems heretofore cited. You are leaving it to the board to define those who may have a *"bona fide* interest", and this does not to me appear equitable.

My company has been actively identified for many years with the work of the National Sand & Gravel Assn., the National Ready Mixed Concrete Assn., and the National Lime Assn. The knowledge which we have thus gained of industry conditions throughout the United States leads me to believe that the operating circumstances which I have described in this presentation are typical of the industries concerned.

German Cement Output and Capacity Increase

The German Portland-cement industry showed an advance not only in production but in capacity in 1936, the U. S. Bureau of Mines reports. Cement shipments reached 11,530,000 tons, compared with 8,630,000 tons in 1935. As the aggregate production capacity of the German cement industry is estimated at 16,000,000 tons, the 1936 output represents a 72 per cent. utilization of capacity that indicates a considerable reserve of unused capacity available for any future extension of activity. This feature is steadily emphasized by the German cement industry, which is enjoying governmental protection against newcomers, in the way of a decree prohibiting establishment of new plants or extension of present available plant equipment. This decree is provisional and the idea that the Hitler government may fail to prolong it is, for the time being, the chief worry of German cement manufacturers.

The available production capacity was given at 13,300,000 tons at the end of 1935. The increase shown in this respect in 1936 is attributed to technical improvements, modernization of backward plants and renewed activity of some works which had been shut down for some time previous.

New York Uses More Agricultural Lime

Agricultural lime sales in New York during the past spring are reported to have been the heaviest in the history of the state, many farmers having used lime for the first time on lands badly in need of it.

By **STANTON WALKER**
Director of Engineering
National Sand and Gravel Assn.

Significance of Research to the Industrial Sand Industry*

SO much has been said about research and its importance that the average man accepts it as an integral part of industry without very clearly realizing its application to himself or to his business. It is a subject much discussed but little understood. Much of what passes for research is spurious. Starting with a conclusion and piling up data with a pretense of supporting it is not research. Starting with facts, adding more facts to them and finding out what they mean represents the only sort of research which will yield lasting benefit.

What is research? Charles F. Kettering of the General Motors Corp., an eminent investigator who has done much to bring about a better understanding of the significance of research, says that it is nothing but looking forward to see in which direction industry may or may not go—"finding out what you are going to do when you can not keep on doing what you are doing now." It seems to me that in those few words Dr. Kettering apostrophizes the significance of research to the industrial-sand industry and to all industry.

Research can not be carried out spasmodically. To be effective it must be continuous; it must represent a persevering pursuit of information. Very little research is spectacular; most of it has to do with simple things—developing a little further information on a subject on which something is known, modifying this and that conception, reaching out for a little better understanding.

The results of research can not, by some legerdemain, be made instantly available for the solution of a problem when it arises, unless the investigation has already been made. Research should endeavor to anticipate problems, and, as often as not, must be carried out before the direct application of the facts developed is clearly understood.

The progress of every successful industry is based on research, whether it is carried out by the consumer of industry products or by the industry itself. That industry which depends solely on consumer research occupies the unhappy position of knowing less about its business than does the customer. It is a follower, not a leader. It may awaken and find that other products have been developed which will serve the purpose just as well. That industry will not know what it is going to do when it can not keep on doing what it is doing now.

It would appear to be axiomatic that a man should know more about his business than anyone else. To do so requires research whether you are running a lunch wagon or a steel mill. Similarly, it would appear equally desirable for those in an industry to know more about it than those outside. That requires research.

Industrial research by industry should be carried out by two types of organizations: (a) by individual companies, and (b) by group action through an organization representing the group. The proportion of the work which should be done by each of the two types of organizations will depend upon the nature of the industry. In general, those investigations having to do with special processes, plant control and the like, and (I ask you to note) *the application of the results of co-operative research*, which makes a company better able to compete with others in the industry, belong with the individual-company research organization. Those fundamental problems which are common to all, or to a group, of the industry, or which involve industry relations with the public or the consumer, should be carried out co-operatively.

Co-operative research not only eliminates costly duplication of effort, but it also sets up an organization which can speak authoritatively for the industry as a whole. It is a short-sighted view to consider that the co-operative development of the proper sort of industry information will make competition more difficult for the progressive and well-informed company and less difficult for the less progressive and less well-informed company. Granted that this will happen in some degree, but that handicap—if it is a handicap—will be more than compensated for by better industry relations, benefits to the consumer with the consequent wider use of industry products, and—highly important—protection against invasion by competitive industries.

In the industrial-sand industry some research is being done by individual companies, a considerable amount by a few, and practically none by many. A small amount of co-operative research has been done, but the amount is very small, and there has been no program for that continuous effort so necessary for the development of fundamental facts.

I do not make that statement critically. Co-operative research requires organization, and the industrial-sand industry has had a co-operative organization for only about two years. Co-operative research requires that the members of the group know and have confidence in each other, and members of the industrial-sand industry are, so far as the majority are concerned, only now becoming acquainted with each other. I do not know if the industrial-sand industry is yet ready for co-operative research, and I urge that it not initiate it until it is ready—ready to support a continuous and persevering pursuit of facts, ready to support work which may yield nothing as well as to apply the results of work which is of value.

I can say this however: co-operative research, properly planned, intelligently directed, and suitably supported, will pay dividends as high as those from any other department of your business. The experience of other industries is such as to make that point hardly debatable. What has been largely responsible for the present status of the Portland-cement industry? Fundamental research carried out through the Portland Cement Assn.,

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the Portland Cement Fellowship at the U. S. Bureau of Standards, and co-operative work carried out at educational institutions. Look at the automotive industry; co-operative research carried out by the Automobile Manufacturers Assn. and by parent groups such as General Motors, Chrysler, and Ford. Turn to radio, to electrical equipment, to any successful industry, and you will find co-operative research of some kind. The sand-and-gravel industry, an industry closely allied to this one, with a limited research program, can point to notable achievements resulting from research conducted by the National Sand & Gravel Assn.

What are the fields for co-operative or group research by the industrial-sand industry? Too often they are thought of as embracing only those in which test tubes, Bunsen burners, and white coats are used. Research is an attempt to find out something, anything; it is not restricted to the natural sciences. I am not prepared to outline for you in any considerable detail the type of co-operative research which I think this industry can do profitably. Perhaps, however, I can present some thoughts which will be of assistance in considering what, if anything, should be done.

First, the group should be ready to accept the responsibilities, as well as the benefits, of co-operative research; the insurance value of such work should be clearly understood. Second, the start should be modest and well planned. And, third, however modest the start, it should be adequately and stably financed. For an industry such as this I should think that desirable co-operative research might be classified somewhat as follows:

(1) Investigations related to the production and use of products of the industry—engineering research.

(2) Investigation of facts having to do with industry operation—accident prevention, accounting methods, production and price trends, working conditions, employer-employee relations, to name only a few.

(3) Investigations of market trends; where the product goes; present and future requirements as to quantity, quality and type.

The results of these investigations would be of no value, of course, if they were kept in the files of the research director and any plan of work should make provision for suitable distribution of the digested results.

I do not need to spend much time in pointing to the problems common to all members of the industry, or to large groups of it, which fall in the three categories outlined earlier. You know of more of them than I. However, let us examine a few which have come to my attention during my comparatively brief connection with the industrial-sand industry.

I am a member of the Sand Research Committee of the American Foundrymen's Assn. I have attended only two meetings of the association and one of the committee, but I have heard enough problems discussed to know that the industry needs to be able to express its viewpoint collectively and authoritatively on many of them. It is true that there are some extremely able representatives of individual companies on that committee, but, even if they had complete data at their disposal, they could speak only for themselves or their company, and not for the industry as a whole.

Is the grain-fineness number a good measure of the grading of foundry sands? Is the grain-distribution number a suitable function to supplement the fineness number? What properties of sands affect, and how do they affect, core hardness, strength, durability, and permeability? What about synthetic sands?

Investigations are being carried out on these questions, but not by the producing industry. At the recent American Foundrymen's Assn. convention I heard several papers dealing with sand presented by representatives of the consumer group, by a manufacturer of testing equipment, by a university professor, but none by anyone representing the producer of sand. The Portland Cement Assn., always on the outlook for new uses for cement, had a representative who presented a paper describing an investigation of cement as a binder for molding sand. These were good, studious papers, but they were not jealous of the viewpoint of the sand industry. The sand producer should be in a position to discuss the properties of foundry sands on an equal basis with the foundryman.

We hear much about the use of steel grit as an abrasive. What are its merits as compared with sand? How much does its use reduce the dust hazard? What are its efficiency and economies? How many groups, in writing regulations for dust control, naïvely assume that the major dust comes from the abrasive and do not know that other sources are of principal importance? It is true that valuable work is being done in a study of such problems by the Air Hygiene Foundation, the American Foundrymen's Assn. and individual consumers, but is that enough, and is it sufficiently attentive to the peculiar problems of the silica-sand industry?

Even with my limited knowledge of the industry, I could name other problems, but these should suffice as illustrations of the opportunities for engineering research.

Similarly, there are many opportunities for research in the second and third classifications suggested, covering industry and marketing facts. The research problems involved there require surveys of past and present conditions, conducted in such a manner that (1) future trends may be anticipated, and (2) industry practices may be regulated to the common benefit of all.

What is your accident rate compared with industry experience? How is your production curve going along with that for the industry as a whole? Which markets are increasing, and which are decreasing? Would not you like to know, and if you did know, would not it help you to regulate your business? Certainly, widespread information on all these things would help your competitor, or what is generally called your competitor, as well as yourself. But I submit that anything that helps the industry as a whole and benefits the public increases your chances of staying in business at a profit. Your real competitor is another industry or another process.

Let us assume that you are sold on the desirability of starting co-operative research right now. What do you do next? You already have an able research committee. Let it select that problem, or those problems, which is or are most pressing. Outline the procedure for studying it or them as well as can be done in the light of existing information. Determine where the investigation can best be carried out. There are many facilities—your own association, educational institutions, private and public research organizations. Probably one of these will be best fitted for one type of research, and another for another. Next, find out how much it will cost and determine if it can be adequately financed. If it can not be adequately financed, forget it, for there is no better way of wasting money than to do half of a research job. Last, get the work under way with competent direction and be prepared to wait for the results and to accept them, even if they are not what you had hoped they would be.

The significance of properly-conducted research to the industrial-sand industry is that it will enable all the industry to know more about itself than others do and show it what to do when it can not do what it is doing now.

1936 Gravel Production Shows Sharp Increase

NONCOMMERCIAL OUTPUT GAINS

Greater activity in building and highway construction in 1936 resulted in increased business for commercial sand and gravel producers compared with 1935, according to the U. S. Bureau of Mines' preliminary report. With the continuation of extensive secondary road programs in many States, partly with work-relief funds, the output of noncommercial operations likewise increased. Available data on consuming markets for sand and gravel and incomplete returns from producers indicate that the total output of commercial and noncommercial plants in 1936 was 172,660,000 short tons valued at $88,747,000. This apparent increase of 39 per cent. in tonnage and 43 per cent. in value from 1935 continued the upswing that began in 1934 following a decline from 1929 to 1933.

Sales of sand for all important uses increased in 1936 compared with 1935. Building sand and gravel, in particular, reflected the sharp upturn in construction and production of paving sand and gravel likewise showed a substantial increase. Purchases of ballast by railroads were much higher than in 1935. The increased output of industrial sands paralleled the continued pickup in the glass and foundry industries and in railroad traffic.

Despite increased demand for sand and gravel for all uses in virtually every section of the country, average prices in 1936 showed little change from 1935. The average value per ton, f.o.b. plant, for all sand and gravel reported by commercial producers remained unchanged at $0.61. A slight weakness in sand prices resulted in a drop of two cents a ton in the average value of sand but it was balanced by an advance of two cents for gravel.

Production of sand and gravel by plants operated by or directly for States, counties, municipalities or other local government agencies apparently increased in 1936 at about the same rate as commercial production. Preliminary data indicate an output of roughly 53,000,000 short tons compared with 39,316,452 tons in 1935. The average value of this material advanced from $0.27 a ton in 1935 to $0.30 in 1936.

Preliminary figures on sand and gravel production in 1936, based on market indicators and partial returns from producers, are compared with 1935 statistics in the following table:

SAND AND GRAVEL SOLD OR USED BY PRODUCERS IN THE UNITED STATES, 1935-36, BY COMMERCIAL AND NONCOMMERCIAL OPERATIONS, AND BY USES

	1935		1936 [1]			
					Percent of change in—	
	Short tons	Value per ton	Short tons	Value per ton	Tonnage	Value per ton
COMMERCIAL OPERATIONS						
SAND:						
Glass	2,125,761	$1.76	2,440,000	$1.70	+15	— 3
Molding	2,980,879	.98	4,000,000	1.04	+34	+ 6
Paving	11,370,611	.56	14,800,000	.53	+30	— 5
Building	15,996,867	.53	27,500,000	.53	+72	..
Grinding and polishing	816,540	1.47	960,000	1.38	+18	— 6
Fire or furnace	172,847	1.18	210,000	1.20	+21	+ 2
Engine	1,389,877	.63	1,500,000	.65	+ 8	+ 3
Filter	49,301	1.90	50,000	2.20	+ 1	+16
Railroad ballast [2]	997,499	.26	1,250,000	.22	+25	—15
Other	1,875,808	.46	1,250,000	.70	—33	+52
Total sand	37,775,990	.66	53,960,000	.64	+43	— 3
GRAVEL:						
Building	14,819,051	.67	26,000,000	.70	+75	+ 4
Paving	19,093,195	.63	27,500,000	.60	+44	— 5
Railroad ballast [2]	7,546,489	.28	11,200,000	.27	+48	— 4
Other	5,372,746	.37	1,000,000	.52	—81	+41
Total gravel	46,831,481	.56	65,700,000	.58	+40	+ 4
Total sand and gravel	84,607,471	.61	119,660,000	.61	+41	..
NONCOMMERCIAL OPERATIONS [3]						
Total sand and gravel	39,316,452	.27	53,000,000	.30	+35	+11
COMMERCIAL AND NONCOMMERCIAL OPERATIONS						
Grand total	123,923,923	.50	172,660,000	.51	+39	+ 2

[1] Subject to revision. [2] Includes some material used for fills and similar purposes. [3] By states, counties, municipalities, and other Government agencies, directly or under lease.

Dismantling Cement Plant at Mildred, Kan.

ENLARGING FREDONIA PLANT

The Mildred, Kan., plant of the Consolidated Cement Corp. is being dismantled and the equipment moved to the company's plant at Fredonia, Kan., the capacity of which is being doubled. Included in the equipment which is being moved are the tube mills, motors, electrical equipment, steel buildings and a 240-ft. rotary kiln.

Producer Builds Plant To Supply Dam Contract

★ Victoria Gravel Co. is constructing a stone crushing and screening plant and opening a quarry between Burnet and Marble Falls, Tex. Ray Hodgeson is local superintendent. Quarrying operations will employ about 30 or 40 men permanently. The company has a contract to furnish crushed rock for Marshall Ford dam during its construction.

Monolith Gets 425,000-Bbl. Contract for Aqueduct

Contract for 425,000 barrels of cement to be used in construction of the Colorado River Aqueduct has been awarded by the board of directors of the Metropolitan Water District, Los Angeles, Cal., to the Monolith Portland Cement Company.

The company entered the low bid of $1.19 per barrel. The contract provides that the district may, at its option, purchase an additional 103,000 barrels of cement from the manufacturer at the same rate. Work on the main section of the aqueduct is now more than three-fourths completed.

Preliminary work for the reopening of the Wabash Portland Cement Co. plant at Stroh, Ind., began recently with the calling of 40 men to repair equipment. About 150 men will be employed. Some of the workers who have been working at the plant at Osborn, O., have returned to Stroh. Glenn Osborn is superintendent.

★ Gottron Brothers Stone Co. of Fremont, O. have purchased a ½-yd. General Excavator Co. clamshell equipped with a 40-ft. boom and ⅝-yd. clamshell bucket.

Basalt Rock Co. Builds Exposition Sea Wall

TRUCKS HAUL RIPRAP TO BARGES

Dredged up from the shoal waters of San Francisco bay, the 430-acre site of the Golden Gate International Exposition is nearing completion on schedule for the opening of the exposition in 1939. Unusual interest, both from engineering and civilian viewpoints, is attached to this undertaking for after the close of the fair the site will be transformed into a fine municipal airport.

In this gigantic construction feat, as in the building of the Golden Gate and San Francisco Bay bridges, motor trucks have labored ceaselessly to complete their tasks on schedule. A fleet of six GMC Model T-46 machines in the service of the Basalt Rock Co. of Napa, Cal., has transported approximately one-half of the riprap material forming the huge sea wall around the entire exposition site.

Over 140,000 tons of rock was involved in this particular phase of the undertaking. Material was hauled by the trucks from the quarry to barges 1½ mi. distant. The barges were loaded in the daytime, towed by tugs down the bay to the exposition site at night, and the next day the material was transferred to its permanent position by floating derricks utilizing a clam-shell.

The sea wall formed by the riprap varies from 15 to 20 ft. in height. Three grades of stone were used, ranging from Grade C (fines) to Grade A, consisting of bowlders weighing from 500 to 6,000 lb. To haul this coarse material the trucks were equipped with extra-heavy 8-cu. yd. bodies. The trucks have been engaged constantly in this work for nearly a year.

When the riprap sea wall is completed, dredges will fill the inclosed portion of the island with sand. Before trees and shrubs can be planted the sand must be washed with fresh water to eliminate salt and other materials deposited by the sea. To provide water for this purpose a large reservoir is being constructed on the island and water will be piped to this reservoir from a line extending over the San Francisco-Oakland Bay Bridge.

This splendid site will not only give San Francisco a veritable "magic island" for its Golden Gate exposition but will also provide this city with one of the world's finest municipal airports, designed to shelter both land and water planes. Careful planning of the exposition buildings allows transformation from exhibit palaces into airplane hangars after the fair is over.

★ Mixed Concrete Corp., Columbus, O., is adding a new unit to its plant, involving the expenditure of $25,000 for a new building and equipment, according to Ralph H. Anderson, vice-president.

This closeup view of the Basalt Rock Co. quarry shows the kind of material used in the sea wall. Three of the six 8-cu. yd. trucks are shown.

Cement Fuel Use Increased in May

COAL STOCK IS MUCH LOWER

As summarized from the reports of the cement producers supplemented by a few estimates, the following quantities of fuel were consumed at the Portland cement plants in the United States in the month of May, 1937, as compared with the production of 11,614,000 bbls. of clinker (unground cement) and 11,634,000 bbls. of fin-cement: Coal, 494,233 short tons; oil, 231,895 bbls. (or 9,739,590 gal.); and natural gas, 4,276,969,371 cu. ft. The producers also reported 397,321 short tons of coal in stock at the mills at the end of May, 1937.

Corresponding figures from the producers' reports for April, 1937, are as follows: Clinker produced, 10,299,000 bbls.; finished cement produced 10,402,000 bbls.; and fuels consumed in its manufacture—coal, 450,358 short tons; oil, 206,543 bbls. (or 8,674,806 gal.) and natural gas, 3,742,320,702 cu. ft. The producers also reported 464,036 short tons of coal in stock at the mills at the end of April, 1937.

In addition to the above fuels, one plant in April and May, 1937 reported the use of petroleum coke. The plant reporting the use of petroleum coke also reported the use of other fuels.

R. Newton McDowell Co. Opening 2 New Quarries

★ Excavation has begun for the foundation of a large rock crusher which is to be installed near Ravenswood, Mo., by the R. Newton McDowell Co., preparatory to opening of a quarry there. A spur is to be built to the plant from the Great Western Railroad. Another plant of the same company is now nearing completion east of Pumpkin Center.

Blasting Damages Sought From Chicago Producer

Suit for damages totaling $250,000 has been filed against the Material Service Corp., Chicago, Ill., by owners of property surrounding a quarry used by the company at Twenty-ninth and Halsted Sts. The suit alleges that buildings have been weakened by the operations of the company, especially in dynamiting.

P AND Q
PROFITABLE
New Products
SECTION

PROFITABLE NEW PRODUCTS

By D. R. (Spec) COLLINS

A typical job. Hundreds like this one have been built the past two years.

A Product Easy To Enthuse About!

BOB DAMEREL, producer of sand and gravel, wanted to diversify his activities. He was considering manufacturing concrete masonry units, bricks, blocks and tiles, but before he arrived at a decision he wrote me asking the factors he should consider before adding new products to his already successful business. My reply consisted mainly of a check-list of questions for him to answer for himself before "stepping off." Bob carefully studied the list and decided he could profitably take on the new venture in connection with his present business. In fact, he's even now thinking beyond concrete masonry. Last week I had a letter from him full of questions. Principally they concerned manufacturing problems but he also wanted my opinion of the concrete joist and floor business — should he take it on as well as concrete masonry?

My reply ran about as follows: "Dear Bob: You ask if there is a future ahead in the manufacture of concrete joists. I don't want to put myself in the position of encouraging everyone to enter this business. I consider it a specialized field because it takes more skill and more engineering ability than the manufacture of concrete blocks. I don't believe that any manufacturer ought to go into this business unless he is prepared to render an engineering service along with it. That is, he ought to be prepared to lay out every job that he sells. A concrete-masonry wall is a simple thing to lay out but a joist floor is a bit more complicated. Now don't get scared when I say that; you are an engineer by training and can do this yourself. But I'm mainly concerned with the products manufacturer who has no engineering background and yet is reluctant to employ a competent engineer to lay out his job at the time he sells it.

"I'd say at the present time that a great many architects are familiar with this type of construction and are perfectly capable of planning their own jobs and ordering the material they will use. But in some cases, spacings are too wide and the bearing is not sufficient to carry the load that these joists are supposed to hold. In the past I've

Spading concrete after it is placed results in smooth, well-formed joists.

A gang of precast joists after molds have been removed. Note reinforcement assembly.

As shown in this illustration two men can handle the average joist with little effort.

always recommend that such a lay-out be made at the time the job is sold and I still want to make such a recommendation.

"But as for the sales possibilities of the joists themselves, I've never seen a concrete product that caught on more quickly or whose market developed more rapidly than the concrete-joist and first-floor market. It seems that the building public was hungry for firesafe first floors in their residences, but up to the time the concrete joist was introduced on a large scale no one had developed a way to do the job economically. Then along came the concrete-joist and development work by the Portland Cement Assn. From a few scattered floors back in 1932 the market has developed to such an extent that it was possible to sell hundreds of thousands of feet of this material in 1936. Why, on one government project alone—a resettlement project near Milwaukee—over 32 mi. of concrete joists were specified for first floors. Now you know yourself from past experience, that government specification writers are mighty tough birds to crack. Unless they were pretty well convinced by the technical data and tests they certainly would not be specifying these joists for their jobs.

"Manufacturers throughout the country have had an experience that has been a revelation to them. Starting with a few jobs the first year they've rapidly expanded their business so that in the majority of cases a great many of the houses built in their respective communities — whether of concrete, brick, stone or lumber—had this type of floor. It's taken real selling to crack the first few jobs, but those first few always made enthusiasts of both architects and owners. From then on the battle wasn't tough.

"Equipment for making concrete joists is comparatively inexpensive. If you've got the room and curing facilities, you can equip yourself to manufacture joists at a sum which will surprise you. Several companies are now making equipment for the manufacture of joists and from what I've seen of it it is mighty satisfactory. Many of the folks making joists started with

After the spreaders are in place smooth form is laid on top to receive reinforcement and concrete.

simple wood molds. Now they are buying manufactured equipment because they find it more economical now that their volume is developing. This equipment usually consists of a simple series of gang molds on a vibrating table and generally is so set up that ten joists are manufactured at one setting. Steel molds are the most practical for permanent equipment. Their cost is really low and by the use of such cores a smooth concrete surface results. One company manufactures a large machine for volume production. I have seen many of the joists turned out on it and they are of excellent quality.

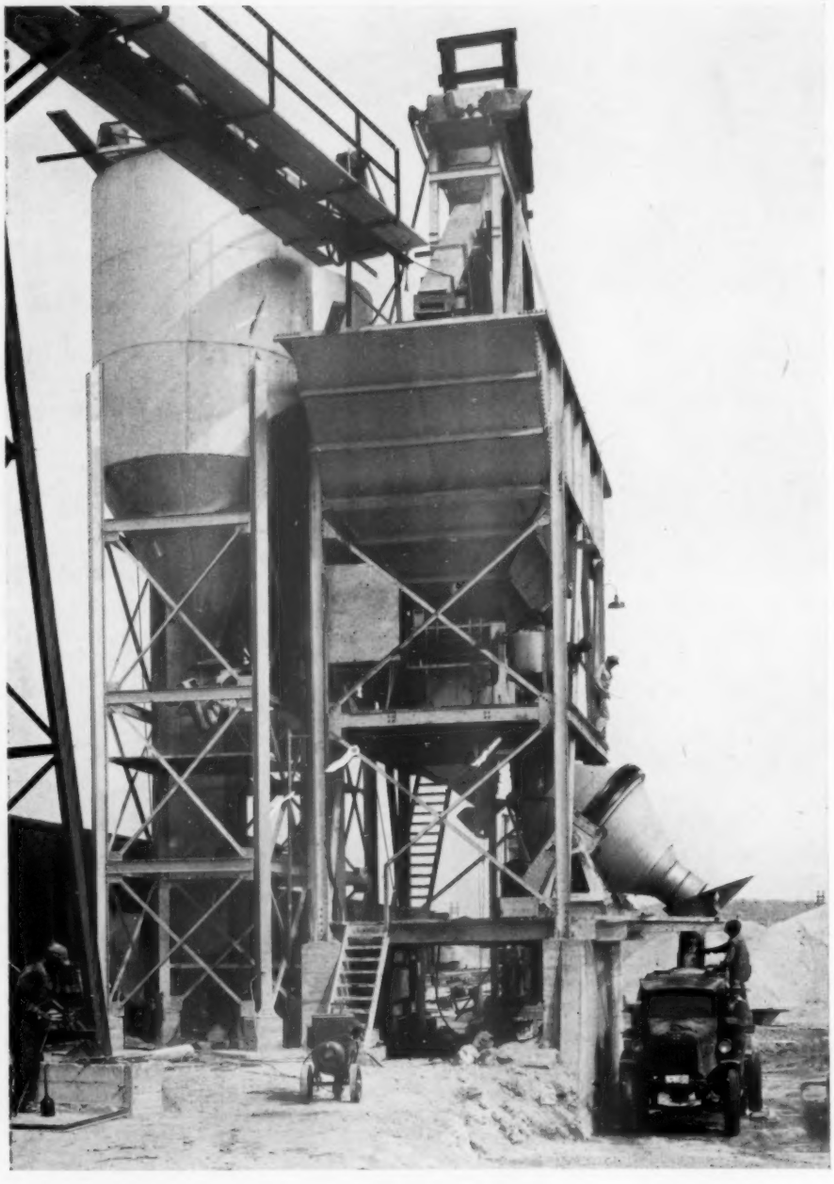
"I mentioned vibration above. It really is the most effective method of placing concrete in making joists when gang molds are used. Vibration increases the density and strength of the joists, considerably improves their appearance and will reduce manufacturing costs. There is no objection to your aggregate for the manufacture of joists. It is a bit heavy but even then two men should readily handle any joists going into the ordinary job. I've seen them do it on any number of jobs. An 8-in. joist 16 ft. long should not weigh more than 275 lb.

"One of the most important things you should remember in the manufacture of joists is proper reinforcement. Tables have been worked out showing this and can be obtained by writing the Portland Cement Assn. Proper size of reinforcement, adequate stirrups, proper assembly and accurate placing of reinforcement are factors

(Continued on page 103)

Spreaders, to hold joists true and on which form lumber is placed, are quickly and easily slipped into place.

By W. E. TRAUFFER



View of slag-concrete plant taken just as construction was completed.

Birmingham Steel Industry Uses Much of Own Slag in The Form of Concrete

IN a recent trip through the South and Southeast the writer found a sharp and general increase in business activity which has been reflected in the nonmetallic-mineral industries and related activities. Producers of aggregates and other nonmetallic minerals are sharing in this upturn in business which has resulted in the improvement of many existing operations and the erection of many new plants to supply materials for construction.

The Birmingham, Ala., district has been especially benefited due to a large extent to the high rate of production of the steel industry, which is an important business factor in this section. This increase in steel production has made available, in ever-increasing quantities, fresh, high-grade slag for the slag-processing plants in and near Birmingham and the construction of additional steel-production facilities is using a large part of this slag in the form of aggregates and ready-mixed concrete.

The Birmingham Slag Co. on April 1, 1937 put into operation a new and modern type of ready-mixed-concrete plant alongside its slag plant at Fairfield, about 7 mi. southwest of downtown Birmingham. This slag plant, which secures its basic blast-furnace slag from the Fairfield works of the Tennessee Coal, Iron and Ry. Co., was built in 1928 and has a capacity of 250 tons per hr. The new concrete plant was erected primarily to supply a 100,000-cu. yd. contract for concrete to be used in a huge expansion program at the T. C. I. & Ry. Co. Fairfield Works. About $30,000,000 is being expended in the construction of new tin-plate and strip mills and the expansion and improvement of existing mills.

The new concrete plant has a capacity of 100 cu. yd. per hr. and is located in a heavy industrial section. It also supplies concrete for the other industries in this district and for the entire southwestern section of the Birmingham district and will continue to do so after the present large contract is completed. The company operates another ready-mixed-concrete plant at Ensley, which serves the northwestern section of the Birmingham territory and the city proper. Sized slag for this new concrete plant, and for a cold-mixed asphalt plant also operated by the company, is brought from the crushing-and-screening plant on a belt-conveyor which discharges it either into six 100-ton steel silos or on a new 24-in. by 70-ft. belt-conveyor feeding the concrete-plant bins. The material in these silos is reclaimed by a bucket-elevator which can discharge either on the concrete plant conveyor or on the first-mentioned conveyor which can be reversed to carry the slag to the cold-mixed asphalt plant.

This arrangement insures a constant

supply of material to both these mixing plants regardless of whether the aggregate plant is operating. Further to insure the independence of the concrete plant from other operations a system has been installed to supply sized slag from the stock-piles when desired.

Hopper cars are loaded from the stock-piles by a crane and discharge the slag into a track hopper. A 24-in. by 15-ft. belt-feeder transfers the slag from this hopper to a 24-in. by 55-ft. Barber-Greene portable belt-conveyor. This portable conveyor ordinarily discharges the slag into the boot of a 24-in. by 60-ft. Link-Belt chain-bucket elevator which in turn discharges it into the concrete-plant bins. If desired, the conveyor can be moved to discharge the slag into stock-piles

Bulk cement being unloaded from cars to concrete-plant bins.

from which it can later be taken by a crane to a small hopper over the boot of this same elevator.

The sand used in the concrete is brought in by railway from the company's sand-and-gravel plant at Montgomery. The sand is discharged into the same track hopper and is conveyed by the same equipment either to the stock-piles or to the concrete-plant storage bins. All the aggregates are discharged through a 4-way chute into the Blaw-Knox 180-ton, 4-compartment aggregate bin over the concrete-mixing plant.

Portable conveyor and elevator which supply sand and slag to plant.

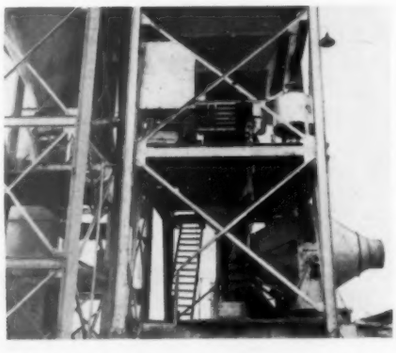
View of concrete plant, showing connection to slag plant in background. Office is at left.

Cement is received in box cars from which it is removed by a Link-Belt double power shovel which unloads simultaneously from both ends of a car. The cement is discharged into the boot of a 12-in. by 55-ft. Link-Belt chain-bucket elevator which discharges it into two 500-bbl. steel storage tanks. Portland cement is ordinarily used but for some work this is blended with pozzuolan (slag) cement.

Under each of the two cement bins is a Link-Belt 9-in. by 9-ft. screw-conveyor inclined 15 deg. upward in the direction of feed. These screws feed the cement into a 2,000-lb. Blaw-Knox automatic cement batcher.

The aggregates are discharged from the bins through clam-shell gates into a 2-cu. yd. Blaw-Knox 2-compartment, 4-material, manually-operated batcher with a 4-beam Fairbanks scale. Water is measured in a Ransome 110-gal. automatic measuring tank.

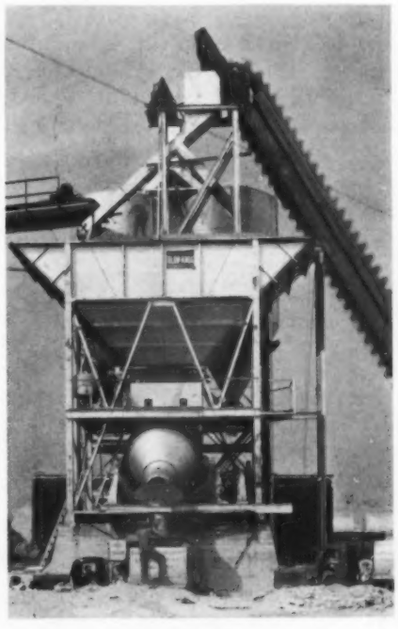
The aggregates and water are discharged into a confining chute feeding a T. L. Smith 2-cu. yd. tilting mixer. The finished concrete is discharged from the mixer into a fixed



Side view, showing mixer and aggregate and water batchers.

truncated cone, to the bottom of which is attached a 3½-ft. flexible spout made of rubber-coated canvas. This spout was devised because of a 3-ft. difference in the height of the two sizes of agitator trucks which deliver the concrete. This spout works very successfully and when a truck is run into the loading position slides without help into the charging hole of the agitator drum.

The company owns 16 mixer-trucks which are being used as agitators and which serve both concrete plants. At present almost all the product is made at the new Fairfield plant. The fleet includes four old 4-cu. yd. Paris



Flexible arrangements for feeding sand and slag to bins.

transit-mixers on Mack trucks and twelve Blaw-Knox 1½-cu. yd. truck-mixers which are being used as 2-cu. yd. agitators. These 1½-cu. yd. units were all purchased during the past year and were originally mounted on several makes of truck chassis. Of these several makes the Internationals gave the best service and it was de-

(Continued on page 103)

Tentative Revolving-Drum Truck-Mixer and Agitator Standards Are Approved

THE *Tentative Standards and Recommended Practices for Truck-Mixers and Agitators of the Revolving-Drum Type,* have been approved by letter ballot of members of the National Ready Mixed Concrete Assn. These specifications, it is emphasized, cover only truck-mixers and agitators of the *revolving-drum type,* and it is not intended to prejudice in any way the use of other types of equipment for which specifications are now under consideration, according to Stanton Walker, director of engineering. These standards are tentative and are subject to revision as frequently as information indicating the desirability of such revision is furnished to the committee. The standards follow:

GENERAL

1. These tentative standards and recommended practices have been prepared by the National Ready Mixed Concrete Assn. in response to an expressed need by architects, engineers and other specification writers for an outline of good practice in the operation of concrete truck-mixers and agitators of the revolving-drum type. These tentative standards and recommended practices do not cover other types of equipment used in the ready-mixed-concrete industry and standards for certain of those types are now under consideration by committees appointed for that purpose. These tentative standards and recommended practices are subject to periodic revision as further studies justify such revision.

DEFINITIONS

2. (a) The truck-mixer covered herein is a closed water-tight revolving drum suitably mounted and fitted with adequate blades, capable of combining aggregates, cement and water into a thoroughly mixed and uniform mass of concrete, and of discharging the mixture without segregation.

(b) The truck-agitator covered herein is a closed water-tight revolving drum suitably mounted, capable of transporting and discharging concrete without segregation.

(c) Truck-mixing is the process of combining the aggregates, cement and water into a thoroughly mixed and uniform mass of concrete in a truck-mixer.

(d) Shrink-mixing is the process of completing, in a truck-mixer while in transit to destination, the mixing of concrete which has been partially mixed in a stationary mixer the minimum amount of time required to incorporate the ingredients into a mass. (Note: About 30 sec.)

(e) Agitating is the process of slowly mixing to prevent segregation, in a truck-mixer or a truck-agitator while in transit to destination, concrete which has already been suitably mixed in a mixer.

CAPACITIES

3. (a) When used for truck-mixing, the capacity of top-door-loading truck-mixers shall be in accordance with the manufacturer's rating but the volume of mixed concrete shall not exceed 50 per cent. of the gross volume of the drum.

(b) When used for truck-mixing, the capacity of end-loading truck-mixers shall be in accordance with the manufacturer's rating but the volume of mixed concrete shall not exceed 57.5 per cent. of the gross volume of the drum.

(c) When used for shrink-mixing, the capacity of truck-mixers shall be in accordance with the manufacturer's rating but the volume of mixed concrete shall not exceed 66.66 per cent. of the gross volume of the drum.

(d) When used for agitating, the capacity of the truck-mixer or of the truck-agitator shall be in accordance with the manufacturer's rating but the volume of mixed concrete shall not exceed 80 per cent. of the gross volume of the drum.

(e) The manufacturer shall attach to each truck-mixer and truck-agitator a metal plate on which is stated the capacities, in terms of volume of mixed concrete, for the various uses to which the equipment is applicable. When a capacity less than the limit indicated in Sec. 3 (d) is shown on the metal plate it indicates the maximum safe load-carrying capacity for which the equipment was designed.

MIXING SPEEDS

4. (a) Mixing speed shall be not less than 4 r.p.m. of the drum nor greater than a speed resulting in a peripheral velocity of the drum of 225 ft. per min. (10 to 15 r.p.m., depending on size of mixer.)

(b) Agitating speed shall be not less than 2 nor more than 6 r.p.m. of the drum.

MIXING TIME

5. (a) In the case of mixing concrete in top-door-loading truck-mixers not less than 40 revolutions of the drum at mixing speed shall be required when the fine and coarse aggregates are charged into the truck-mixer simultaneously. (Note: Cement and water may be charged separately.) When the fine and coarse aggregates are charged into the drum separately, not less than 60 revolutions of the drum at mixing speed shall be required for mixing the concrete.

(b) In the case of mixing concrete in end-loading truck-mixers not less than 60 revolutions of the drum at mixing speed shall be required when the mixer is loaded in excess of 50 per cent. of the gross drum volume as provided in Sec. 3 (b). When end-loading truck-mixers are loaded not to exceed 50 per cent. of the gross volume of the drum, the provisions of Sec. 5 (a) shall apply.

(c) In the case of shrink-mixing not less than 40 revolutions of the truck-mixer drum at the mixing speed shall be required.

(d) In the case of truck-mixing and shrink-mixing not more than 150 revolutions of the drum shall be at a speed in excess of that specified in Sec. 4 (b) as agitating speed. Additional mixing shall be at agitator speed.

(e) When means for verifying the mixing time is required, one of the following devices shall be employed:

(1) A batch meter and locking device mounted on the truck-mixer capable of preventing the discharge of the mixer prior to the completion of the required number of revolutions.

(2) A counter mounted on the truck-mixer permitting of reading the revolution count at the proportioning plant and at destination.

TIME OF HAULING

6. Concrete shall be delivered to the site of the work and discharge from the truck-mixer or truck-agita-

tor completed within a period of 1½ hr.* after the introduction of the mixing water to the cement and aggregates, or after the introduction of the cement to the aggregate when the mixer drum contains residual water, or the fine aggregate contains moisture in excess of 6 per cent. by weight, or the coarse aggregate contains moisture in excess of 3 per cent. by weight.

WATER MEASUREMENT

7. (a) In the case of truck-mixers a water-measuring device shall be provided to measure accurately the quantity of water for each batch. The device may be mounted on the truck-mixer or located at the point of loading the truck-mixer. It shall permit of ready access and of ready determination of the amount of water used.

(b) When wash-water is used as a portion of the mixing water for succeeding batches it shall be accurately measured and taken into account in determining the amount of additional mixing water required.

* NOTE: Results of research have shown that a period of 1½ hours between the introduction of mixing water and the completion of the discharge of the batch results in no detrimental effects on the concrete. The data indicate that under specially favorable conditions periods up to 2 and 3 hours may be allowed. When air temperatures are unusually high, or the ingredients of the concrete mixture are such that an unusually quick time of set or loss of plasticity may occur, it may be necessary to specify shorter periods to insure that no damage be done to the concrete; under these circumstances an investigation, satisfactory to the Engineer, with the materials to be used and in the proposed proportions, should be conducted to determine if a shorter period is necessary. It is unlikely that, under any circumstances, it will be necessary to substitute a period of less than 1 hour for the 1½ hours applicable to normal conditions.

Easy To Enthuse! (from page 99)

that are all important in the manufacture of precast concrete joists.

"After you've removed the joists from the molds they should be kept moist for several days. Delivery is usually made when the joists are about two weeks old, but with the use of high-early-strength concrete this period may be considerably reduced.

"Three factors are mainly responsible for the success and spread of the joist business: First, less cost in comparison with more orthodox types of concrete floors. Second, a new acceptance on the part of the public for the necessity of fireproof floor construction. Third, the fact that the public is extremely termite conscious, so much so that concrete floors are almost mandatory in some communities. Putting these three together has built a market. When I say market, I mean for the

Concrete joists are being used in many homes for second floors as well as first floors.

average-size residence where cost is a matter of vital concern. Construction economy through the use of precast joists now makes it possible to build concrete floors at from only 12 to 14c. per sq. ft. higher than wood construction. In some communities this is even less.

"Another thing that appeals to me as far as you are concerned is the fact that along with selling joists you will automatically create a market for aggregate which would go into the concrete for the floors themselves. A good share of your concrete-masonry business to start with, as your letter would indicate, will be basement business. Now every one of these basements is a prospect for a concrete-joist floor. The same man who sells the basement is going to be able to talk concrete joists at the same time. Then when he gets the order for the blocks and joists, he's also going to be able to take an order for the aggregate used in the concrete slab. Doesn't that sound, then, like a mighty logical combination?

"So, I can't see why you're wondering about the joist business. It's certainly here to stay. Joists are now just as standard a product as concrete-masonry units. In fact, many architects who would never consider concrete-masonry for houses immediately 'took' to concrete joists. If you could sit where I do and see the list of jobs that are going in all over the country, you'd realize why I am so enthusiastic about the manufacture of joists. I don't know of any one concrete product that's ever caused me to get up and cheer as loudly as concrete joists have during the past three years.

"I'm sending along a bunch of pictures of some recent joist jobs. Also a couple of views showing manufacturing. If you want technical data I'll be glad to supply them to you. You don't have to worry about the structural qualities of the joist. It is, of course, designed primarily for relatively-light loads. The Portland Cement Assn. has, however, conducted exhaustive tests to determine structural qualities. Report giving the results of these tests are available if you want them. I am sending in addition to the pictures, a manual giving details of manufacturing. Look it over; then if there are any questions you want to ask, drop me a line. Here's a worthwhile product I'm certain you'll want to make."

Birmingham (from page 101

cided gradually to replace the other makes with Internationals. With this aim in view six new International truck chassis were purchased late in April.

This plant was designed by F. M. Taylor, chief engineer of the Birmingham Slag Co. The Link-Belt Co. supplied all the belt-conveyors and elevators except the portable conveyor. The Blaw-Knox Co. supplied most of the other equipment and also the electric vibrators which are used on all the cement and aggregate chutes and on the cement-weighing batcher to keep material from sticking.

Predict Expansion in Glass Wool Manufacture

Glass wool, a special type of mineral wool, has attracted much attention during the past year. The Corning Glass Works has erected a factory solely for its production. The glass fibers are extremely fine; their diameters range from 0.0007 to 0.00005 in. They are so strong and flexible that they may be woven into serviceable fabrics. The unusual strength of glass wool is attributed to the high ratio of surface area to weight. A large cordage company now sells rope and cord made of glass yarn. Glass wool is nonhygroscopic and thus protects insulated surfaces from corrosion. It is also proof against insects, rodents, fungus, fire, and decay.

Glass wool, the U. S. Bureau of Mines says, was first made in Germany by softening glass rods and winding the thread on bicycle wheels. Its manufacture is now a highly-developed industry in that country. The two principal fields of utilization in Germany are insulation and filtration.

F. T. C.

(from page 29)

tation when available by highways and waterways.

They have prohibited diversion of cement in transit.

They have resorted to misleading propaganda as to the competitive character of their practices.

They have deprived branches of the Federal government buying cement for numerous western projects of part of the benefit of land-grant railroad rates.

They have arbitrarily divided customers into classes: those who may buy direct and those who may not.

They have made arbitrary definition of which middlemen shall be regarded as "cement dealers." Others have not been permitted to buy.

They have made uniform terms and discounts.

They have at times used boycott and espionage of dealers to eliminate the competition of foreign-cement importers.

The system is also alleged to be one of price discrimination since under it the true or net prices received by each producer, from various customers, are substantially different. Customers nearest the mills are obliged to pay higher net prices than are made by a local mill to distant customers.

As to the public interest in support of the case, the following allegations are made:

The direct and immediate result of the said combination has been and is restraint upon interstate commerce with respect to cement manufactured by any of the producing respondents to be transported beyond the state in which the cement was made. Such confederated action exercises a power which individual action could not exercise or possess, and the necessary tendency and the direct and substantial effect of the combination is injury to the public.

The effect of the respondents' combination upon the public interest has been and now is:

(1) To bring about the disappearance of prices arrived at through the play of competitive forces, and the adoption by concert of organized producers of prices calculated to preserve the more poorly located, equipped, and conducted units at the expense of the buying public.

(2) To lessen the demand for cement and the volume of public and private construction in which cement is used.

(3) Correspondingly to lessen the opportunities for employment, both in the cement industry and in the construction industry.

(4) To raise the cost of public roads and projects and private structures in which cement is used and thereby either to make them less available to the public or to raise the taxes and rents by which the public pays for them.

(5) To encourage the development of excess capacity by the inducement of high prices and of fictitious freight charges obtainable by mills not located at basing points.

Respondents Named in the Complaint

The Cement Institute, an unincorporated association, whose membership comprises practically every producer of cement in the country, divided into Northeastern, Southeastern, Chicago, and Kansas City divisions, each with its office, with freight-rate bureaus located at Bethlehem, Pa., and Chicago, is named as a respondent, as are S. W. Storey and G. H. Reiter, president and secretary, respectively, of the institute.

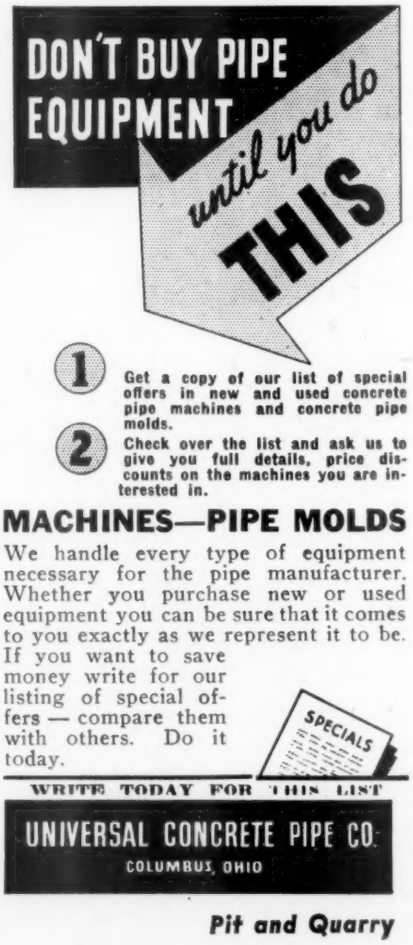
The manufacturing companies named as respondents are:

Aetna Portland Cement Co., Detroit; Alpha Portland Cement Co., Easton, Pa.; Arkansas Portland Cement Co., Denver, Colo.; Ash Grove Lime & Portland Cement Co., Kansas City, Mo.; Beaver Portland Cement Co., Portland, Ore.; Bessemer Limestone & Cement Co., Yougstown, O.; Calaveras Cement Co., San Francisco; California Portland Cement Co., Los Angeles; Castalia Portland Cement Co., Pittsburgh; Colorado Portland Co., Denver, Colo.; Consolidated Cement Corp., Chicago; Coplay Cement Mfg. Co., Coplay, Pa.; Cumberland Portland Cement Co., Cowan, Tenn.; Dewey Portland Cement Co., Kansas City; Diamond Portland Cement Co., Middle Branch, O.; Edison Cement Corp., New York; Federal Portland Cement Co., Inc., Buffalo. N. Y.; Florida Portland Cement Co., Chicago; Georgia Cement & Products Co., Atlanta; Giant Portland Cement Co., Philadelphia; Glens Falls Portland Cement Co., Glens Falls, N. Y.; Great Lakes Portland Cement Corp., Buffalo, N. Y.; Green Bag Cement Co. of West Virginia, Pittsburgh; Hawkeye Portland Cement Co., Des Moines, Ia.; Hercules Cement Corp., Philadelphia; Hermitage Portland Cement Co., Nashville, Tenn.; Huron Portland Cement Co., Detroit; Idaho Portland Cement Co., Inkom, Ida.; International Cement Corp., New York; Keystone Portland Cement Co., Philadelphia; Kosmos Portland Cement Co., Louisville, Ky.; Lawrence Portland Cement Co., Siegfried, Pa.; Lehigh Portland Cement Co., Allentown, Pa.; Marquette Cement Mfg. Co., Chicago; Medusa Portland Cement Co., Cleveland; Missouri Portland Cement Co., St. Louis; Monarch Cement Co., Humboldt, Kan.; Monolith Portland Cement Co., Los Angeles; Monolith Portland Midwest Co., Los Angeles; National Cement Co., Birmingham, Ala.; Nazareth Cement Co., Nazareth, Pa.; Nebraska Cement Co., Denver, Colo.; North American Cement Corp., Albany, N. Y.; Northwestern Portland Cement Co., Seattle, Wash.; Northwestern States Portland Cement Co., Mason City, Ia.; Oklahoma Portland Cement Co., Denver, Colo.; Oregon Portland Cement Co., Portland, Ore.; Pacific Portland Cement Co., San Francisco; Peerless Cement Corp., Detroit; Pennsylvania-Dixie Cement Corp., New York; Petoskey Portland Cement Co., Petoskey, Mich.; Pittsburgh Plate Glass Co., Pittsburgh; Portland Cement Co. of Utah, Salt Lake City; Riverside Cement Co., Los Angeles; Santa Cruz Portland Cement Co., San Francisco; Signal Mountain Portland Cement Co., Chicago; Southern States Portland Cement Co., Rockmart, Ga.; Southwestern Portland Cement Co., El Paso, Tex.; Spokane Portland Cement Co., Spokane, Wash.; Standard Portland Cement Co., Cleveland; Superior Cement Corp., Portsmouth, O.; Superior Portland Cement, Inc., Seattle, Wash.; Three Forks Portland Cement Co., Denver, Colo.; Trinity Portland Cement Co., Chicago; Union Portland Cement Co., Denver, Colo.; Universal Atlas Cement Co., Chicago; Valley Forge Cement Co., Catasauqua, Pa.; Volunteer Portland Cement Co., Knoxville, Tenn.; Vulcanite Portland Cement Co., Philadelphia; Wabash Portland Cement Co., Detroit; West Penn Cement Co., Butler, Pa.; Whitehall Cement Mfg. Co., Philadelphia; Wolverine Portland Cement Co., Coldwater, Mich.; Yosemite Portland Cement Corp., Merced, Cal.

All the foregoing named corporate respondents are producers of cement and members of the institute. Many of them have mills in more than one locality.

The respondents have been allowed twenty days from the date of the service of the complaint in which to file answer to the allegations contained therein.

Shipments of talc from the Death Valley district in California in May, at 56 cars, are reported to be the largest tonnage of this material ever handled in that month by the T. & T. R. R.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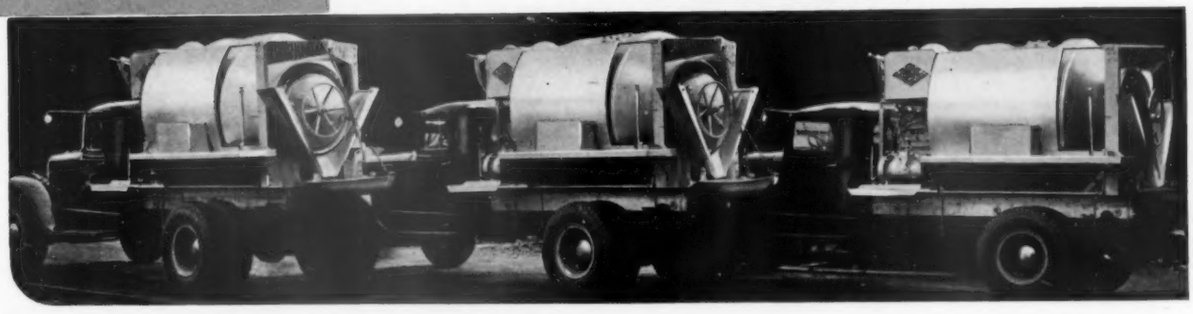

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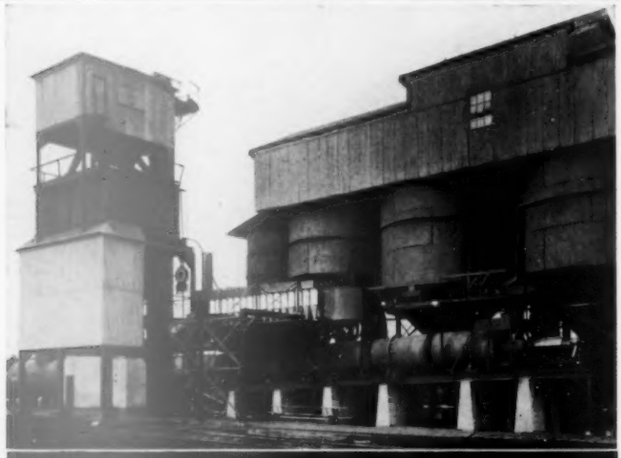

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JOHN L. A. GALSTER
President and Treasurer
Petoskey Portland Cement Co.

MEN · OF · THE · INDUSTRY

Traveling about Michigan some years ago, as operator of the Galster Insurance Agency, Mr. Galster was struck by the state's abundant resources for the manufacture of cement. The Petoskey Portland Cement Co., which was formed in 1917 and in 1921 began the manufacture of cement at Mr. Galster's home city of Petoskey, was the outcome of that observation. Mr. Galster served as general manager and treasurer of the company, also of the Petoskey Transportation Co., until January, 1937, when he was elected president and treasurer of the two companies. Born in Buffalo, N. Y., Mr. Galster has spent the greater part of his life at Petoskey. His chief recreations are hunting and fishing; for many years he has been president of the Galster Hunting Club with a lodge in the Porcupine Mountains near Ontonagon, Mich. He is a veteran member of the Republican State Central Committee, has served for a number of years as councilman and mayor of Petoskey, and also as president and director of the Petosky Chamber of Commerce.

Personal Mention

BLAINE S. SMITH, president of the Universal Atlas Cement Co., was interviewed in the series of "Money Talks" interviews over radio station WMAQ on June 30. The program was sponsored by a Chicago bank and included 39 interviews with leading Chicagoans who head representative industries in the city.

G. C. SKINNER has been made general superintendent of the Independence Sand & Gravel plant at Independence, Ore., which was recently taken over by new owners and is being made ready for operation.

JOHN AHNFELT and A. G. CARLSON, officials of the Universal Atlas Cement Co. who will retire September 1, are being given a round of testimonial dinners by associates. Mr. Ahnfelt is operating manager, formerly general superintendent of the Buffington, Ind., plant, and Mr. Carlson is chief engineer of all plants.

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MRS. M. K. LOUNSBURY, treasurer of the Allwood Lime Co., Manitowoc, Wis., has been elected director of the National Lime Association to represent the interests of District 8 during the new fiscal year which began July 1.

WILLIAM ONG has been appointed manager of the public-relations department of the American Steel & Wire Co., Cleveland, O. Mr. Ong was formerly employed by the Wall Street Journal in New York and Montreal.

H. J. MAUDERER was elected auditor of the Westinghouse Electric International Co. at a board meeting held in New York recently. Mr. Mauderer entered the employ of the Westinghouse organization as a general accounting clerk December 10, 1920. In April, 1924, he was elected assistant auditor of the company and served in that capacity until his promotion. He will make his headquarters at 150 Broadway, New York City.

H. B. ALLEN, who for fourteen years was New York district sales manager of the Babcock & Wilcox Tube Co., has resigned from that company to become vice-president of John B. Astell & Co., Inc., 90 W. Broadway, New York, distributor in the New York metropolitan district of B & W carbon steel boiler tubes and alloy tubes and other tubular products, including welding fittings.

DANIEL E. RITTER, vice-president and general manager of the Lehigh Portland Cement Co., died on June 13 at his home in Allentown, Pa. He was 63 years old, had been with the Lehigh company for about 35 years and had been vice-president and general manager since 1915. He was president of the Lehigh County council of Boy Scouts.

J. A. SUNDERLAND, first vice-president and senior member of the board of directors of the Ash Grove Lime & Portland Cement Co., died suddenly at his home in Omaha, Neb., June 8. He was an older brother of L. T. Sunderland, president and chairman of the board of the Ash Grove company.

WILLIAM S. WALKER, 66, president of the American Silica Sand Co., Ottawa, Ill., died June 16 after a week's illness. He was at one time manager for the Peabody Coal Co. at St. Louis.

WILLIAM B. LALOR, assistant general sales manager of the Coplay Cement Mfg. Co., in charge of its Philadelphia office, died June 16, in Germantown Hospital, Germantown, Pa.

CHARLES OSCAR SUTERMEISTER, 69, president of the A. Sutermeister Stone Co., died at his home in Kansas City, Mo., June 16. He had been president of the company since its incorporation in 1930, and had been associated with the business since 1899.

JOHN MARTIN BUCHHEIT, 65, superintendent of the Brixment plant and quarries of the Louisville Cement Co. at Speed, Ind., was killed instantly on June 23 in a head-on collision of his car and a truck. He had been employed at the Speed works since 1886, and had been head of his department for 20 years.

CARL STRICKLER, 31, an employee of the Michigan Limestone & Chemical Co., Rogers City, Mich., was killed in an automobile accident recently.

CHARLES E. HEATH, vice-president and general manager of the Fate-Root-Heath Co., Plymouth, O., builder of Plymouth locomotives, died May 19.

Coming Events

October 8-9, 1937, Urbana, Ill.—Mineral Industries Conference, University of Illinois.

January 17-22, 1938, Cleveland, Ohio. — Annual Road Show, American Road Builders' Assn., Cleveland Auditorium.

January 24-26, 1938, Cincinnati, Ohio. — Twenty-first annual convention and machinery exhibition, National Crushed Stone Assn., Netherland Plaza Hotel.

January 21-February 3, 1938, Cincinnati, Ohio. — Twenty-second annual convention and machinery exhibition, National Sand & Gravel Assn., Netherland Plaza Hotel.

February 4, 5, 1938, Cincinnati, Ohio. — Annual convention and machinery exhibition, National Ready Mixed Concrete Assn., Netherland Plaza Hotel.

Foreign Developments

One Cement Composition Not Suited to All Uses

A highly significant development in cement technology during the last twenty years or so, according to Dr. Vieri Sevieri of Florence, Italy, writing in *Tonindustrie-Zeitung* for March 1, 1937 (61:197-198), is the realization that one and the same cement of determined composition is not appropriate to all uses of cement and concrete, but that cements of varying compositions are demanded for the most favorable results on different types of jobs. About ten years ago it was widely held that the ideal cement, for any purpose, was one high in lime, sharply burned, with a lime content of 65 to 67 per cent., thus consisting predominantly of tricalcium silicate. Because of the increased strengths these cements show at 1, 3, 7 and 28 days, as compared with ordinary Portland cements with 62 to 64 per cent. CaO, they were called at first "high-strength" or "super" cements, whereas to-day they are commonly designated more explicitly as "high-early-strength" cements. Likewise the overall importance of compressive and tensile strengths has diminished as increased stress has been laid on other properties of high importance for specific employments: shrinkage behavior, heat development in setting and hardening, and chemical resistance to sea water and other aggressive waters. Numerous investigations have consequently been made with the object of obtaining high-early-strength cements with appropriate special properties according to the use for which they are intended.

Professor Ferrari has shown that it is possible to obtain a high-early-strength Portland cement with comparatively little shrinkage, moderate heat development and good chemical resistance to sea water, keeping the tricalcium-aluminate content as low as possible. This is done by combining the alumina, with corresponding proportioning of iron oxide, into the tetracalcium aluminate-ferrite, which requires an alumina modulus of about 0.64. These cements have been called "Ferrari cements".

Dr. Haegermann found the best Portland cements for road-building to be those in which the tricalcium silicate does not exceed 60 per cent., containing not more than about 1 per cent. of free lime; it was also recommended that too fine grinding be avoided. Dr. Schwiete is also of the opinion that the free-lime content should not exceed 1 per cent. As to the influence of fineness of grinding, Dr. Schwiete found in a series of tests that an increase of about 30 per cent. in the specific area gave a 50-per cent. increase in shrinkage and only a 15-per cent. increase in bending strength and a 25-per cent. increase in compressive strength. In other tests Dr. Schwiete found that the best results as to shrinkage at the end of 28 days were obtained with the cement with highest content of tricalcium silicate; these results, however, are not to be taken as generally true, but specifically for the cements tested.

In an investigation involving the various cements recognized in the Italian standard specifications Prof. Luigi Santarella found that cements with large quantities of basic granulated blast-furnace slag, even when they are high-early-strength, always liberate less quantities of heat in hydration than other cements, making them particularly desirable for massive construction and hot climates.

The Effect of Storage Conditions on Specimens

The influence of the conditions of storage on the subsequent behavior of test specimens in mortar tests, with special reference to phenomena of swelling and shrinkage, is the subject of a study by Dr. Alois Frank published in *Zement* for March 4 and 11, 1937 (26:137-141, 153-155). Various earlier observations and conclusions with respect to combined storage are explained or confirmed, and it is concluded that the tests on concrete for works of large dimensions, subject to load, and exposed to variations of temperature and the actions of weathering, should reveal approximately the volume changes to be expected from exposure to such conditions.

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Traffic News Digest

Legislation

Black-Connery Bill—Following President Roosevelt's message to Congress relating to federal regulation of wages and working conditions, a bill was introduced in the Senate by Senator Black of Alabama designated as senate bill No. 2,475 and an almost identical bill was introduced in the House by Representative Connery of Massachusetts as H. R. Bill No. 7,200. Newspaper publicity has made the public acquainted with the general provisions of this proposed regulation of labor in producing material moving in interstate commerce. Objection to being included in the provisions in the bill have been made by both rail and truck carriers. The rails are now subject to the railway labor act and the Adamson 8 hour act and the hours of service of motor truck employees are subject to regulation by the Motor Carrier Act. R. V. Fletcher, general counsel of the Association of American Railroads, in a hearing before the joint congressional committee said that present laws had accomplished in the rail industry the things that were sought in the Black-Connery Bill and recommended that the railroads be excluded from the provision of this new legislation. J. N. Beall, general counsel of the American Trucking Association. Inc., in his appearance before the joint congressional Committee asked that the act be amended to exclude any transportation agency subject to regulation by the Interstate Commerce Commission. He called attention to the fact that the Commission now has jurisdiction over hours of service and qualifications of employees and that about 30 states have regulations covering hours of service. Continuing he said that the Black-Connery Bill appeared to cover intrastate transportation as it adversely affects interstate commerce while on the other hand the Interstate Commerce Commission has no jurisdiction over intrastate rates. The trucking companies would therefore be faced with a federal regulation of hours and wages of employees and by state regulation of rates. He also called attention to the fact that there is now a serious shortage of skilled drivers and that safety would be imperiled if it were necessary to reduce the hours to such an extent that a large number of new drivers would be needed. The extent of state regulation was illustrated in his testimony by the load limit which various states allowed. In most states the load limit is from 10 to 20 tons but in Kentucky, Alabama, Tennessee, Mississippi and Louisiana the limit is about 5 tons. In Texas the limit is 7 tons going to rail stations but only 3½ tons if the truck passes the rail station. Charles M. Haye counsel for the Railroad Labor Executive's Association appearing for all of the standard rail unions except the brotherhood of railway trainmen and maintenance of way brotherhood recommended that the railroads be exempt from the provisions of the bill. He said that railroad labor was well organized and would be better off to bargain for itself. J. A. Farquharson appearing for the Brotherhood of Railroad Trainmen also asked that rail employees be exempt from the provision of the bill. On the other hand Leo Keller vice president of the brotherhood of maintainence of way employees favored inclusion of his group in the provisions of the bill.

Rail Pensions—The Wagoner-Crosser Railroad Retirement Bill was passed by the House on June 21st and by the Senate on the 23rd and was signed by the President on the 24th becoming effective immediately. This act provides pensions for railroad employees who are over 65 years of age, or who are over 60 years of age and have completed 30 years of service or any who have become totally or permanently disabled who have completed 30 years of service. Death benefits will be paid in cases where the deceased was employed after December 31, 1936. Beginning as of January 1, 1937, a pay roll tax of 2¼% will be levied on the carriers for the years 1937, 1938, and 1939 and a deduction of 2¼% will be made from the employees pay check. The railroad and the employees will not be subject to the old age pensions provisions of the Social Security Act. Free transportation may be allowed to pensioners on the same basis as such transportation is accorded to regular employees. As this regulation is the result of an agreement reached between representatives of class I railroads and representatives of rail labor, it is not exepected that there will be any litigation to test the constitutionality of the act.

Train Limit Bill—The Transportation Association of America in making a report on the McCarron train limit bill (S69) in presenting figures showing the relation of train length to accidents shows that a decrease in train length which would be made up with a greater number of trains would tend to increase accidents. In summing up the results of its investigation, the Association says: "(1)—A law limiting the length of trains is not sound. It promises no real advantage to anyone for long. It may sound plausible, but it is against the public interest. (2)—The safety argument for a train length law is not upheld by experience or facts. Instead of increasing safety the net effect of such legislation would be to decrease it, not only for railroad employees but also for the public. (3)—The $90,000,000 to $180,000,000 per year additional expense estimated as the cost of arbitrarily limiting the length of trains would come out of the pockets of the public and would not benefit the 225,000 railroad employees for whose benefit it supposedly is advocated. (4)—Instead of adding to the value of the investment supporting the jobs and earnings of railroad employees it probably would subtract some eight billions of dollars, and more. There is nothing at stake that would justify throwing that vast sum out of the window in one sweep. (5)—The long and the short of it is that no matter how good the intentions of the proponents may be, there is no sound reason why there should be a law to limit the length of trains and there is every reason why there should not be one. (6)—Finally, it is clear that subjects such as the size of trains should be handled through negotiations between management and employee, and not subjected to legislative attention."

Reorganization—In a report made by the Brookings Institution for a general committee headed by Senator Byrd of Virginia investi-

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ASK FOR CATALOG 36

gating proposals to increase the Cabinet and to place the Interstate Commerce Commission under the jurisdiction of a cabinet member; a comprehensive array of evidence was introduced to show how the Commission should not be included in the Cabinet. The Commission as originally constituted and as it functions today is a department of Congress and is not subject to the executive department of the government, except that the President has the power to appoint members to the Commission subject to the consent of the Senate. The report points out that it would be difficult for the Commission which is a quasi-judicial body to function properly and with fairness to all concerned if it is subject to political control as it would be if it were a branch of the executive division of our government. The bill proposing to reorganize governmental commissions was introduced in the Senate by Democratic leader Robinson as Senate bill No. 2,700. On account of the opposition to placing the Commission directly under a cabinet member the bill provides for the Commission being left as an independent unit but gives the President the power to appoint employees, and transfers from the commission to the department of Commerce all functions relating to the preparation of estimates of appropriations, the appointment of personnel and maintainence of personnel records, the procurement of material, supplies, and equipment, the accounting for public funds, the rental of quarters and related matters.

Rate Making—The Senate interstate commerce committee recommends the passage of Senate bill No. 2,410 which provides the basis for determining whether a rate is confiscatory or not. The proposed bill reads as follows: "It shall be prima-facie evidence in any court of the United States of the validity of an order of an administrative agency of the United States, or a state or of any political subdivision thereof, prescribing rates chargeable by a public utility or common carrier, made pursuant to lawful authority and after reasonable notice and hearing, if the rates prescribed by such order produce such a return upon the prudent investment in the property used and useful in the public service as to allow such utility or carrier adequately to finance its reasonable obligations and perform its functions necessary in the public interest; and no such order shall be set aside, modified, enjoined, suspended, or restrained by any such court unless the court shall find that the rates prescribed thereby are confiscatory."

Recent I. C. C. Decisions

Crushed Stone—In response to 4th section application No. 16,572 four section relief has been granted on crushed stone and limestone from Omaha, Louisville, and Weeping Water, Neb., to Kansas City, Mo. and destinations in northern Kansas. I. C. C. F. S. O. No. 12,825 limestone from Nebraska to Kansas.

Crushed Stone and Slag—In response to 4th section application No. 16,618, 4th section relief has been granted on crushed stone and slag from points in western New York to destinations in western New York and Pennsylvania. I. C. C. F. S. O. No. 12,782.

Lime—On protest of the Texas Industrial League regular schedules proposing to permit shipment of lime in mixed carloads with plaster and articles grouped therewith, from origins in Iowa to destinations in southern territory were suspended. The commission has decided that there was no evidence justifying a conclusion that the proposed rule would result in less than minimum reasonable rates or that it would cause undue prejudice to any person or any locality. I. C. C. Docket I. & S. No. 4,297, Lime, mixed carloads, from Fort Dodge, Iowa to the south.

Reparation has been awarded on finding that the rate charged on 368 carloads of lime from Middletown, Ind., to South Charlestown, W. Va., between May 15, 1934 and April 2, 1936 was unreasonable to the extent it exceeded 14c per 100 lb., C. L. minimum wt. 50,000 lb. The present rate of 14c was found not unreasonable. I. C. C. Docket No. 27,409, Louisville Cement Co. v. C. & O. et al.

Sand—Reparation has been awarded on finding the applicable commodity rate on silica sand from Ottawa, Ill., to Cleveland, Ohio of $3.15 unreasonable to the extent it exceeded $3.00 on shipments originating on the Burlington and $2.80 on other shipments moving between Jan. 21, 1933 and Nov. 28, 1934. I. C. C. Docket No. 27,546. Perfection Stove Co. v. Rock Island et al.

Sand and Gravel—The commission has found the applicable rate on sand and gravel from Hawarden, Iowa to Waterbury, Neb. unreasonable to the extent it exceeded 85c per net ton. An 85c rate was in effect and was erroneously cancelled Apr. 20, 1935 and was superseded by a rate of 95c. Carriers are authorized to waive collection of outstanding undercharges. I. C. C. Docket No. 27,599 Booth & Olson Inc., v. Burlington et al.

The report and orders in 177 I. C. C. 123 and 197 I. C. C. 215 have been modified to exempt from the provisions of these orders the intra-state movement of gravel from Scotts, South Carolina to Charlestown, S. C. This permits the rail carriers to reduce the rate from $1.35 to $1.10 per ton to meet water competition. I. C. C. Docket No. 22,109, in the matter of rates on sand, gravel, crushed stone, etc. within the state of South Carolina.

New Complaints Filed

Crushed Stone—Alleging violations of sections 1 and 3 in connection with the rates on crushed stone and related articles from Pinehill, Mich., Joliet, Ind., and Wausau, Wis. to Lowell, Ind. with manufacturers in the Chicago district and other points preferred, new rates and reparation are sought in a complaint filed by Abbott Coburn, president, 176 West Adams St., Chicago, Ill., in I. C. C. Docket No. 27,744 Globe Roofing Products Co. Inc., Lowell, Ind., v. C. & N. W. et al.

Quarry Products—Rates on various commodities including quarry products have been attacked under sections 1 and 3 on traffic from southern territory to official territory. The violation of section 3 allegedly resulted from a lower level of rates between points in official territory than applies from southern territory to destinations in official territory. The complaint was filed by Hugh White, Alabama Public Service Commission, Montgomery, Ala., et al in I. C. C. Docket No. 27,746 the State of Alabama et al v. N. Y. C. et al.

Sand—The rates on sand from Clayville, Millville, and Manumuskin, N. J., to Branford, Conn. are alleged unreasonable and reparation is sought in a complaint filed by Leo Tessler, 1148 Manor Avenue, New York City, N. Y., in I. C. C. Docket No. 277,732 Malleable Iron Fittings Co., Branford, Conn., v. New Haven et al.

Reparation under section 1 is sought in connection with a movement of sand from Davisville, R. I. to Coxsacksie, N. Y., in a complaint filed by Abner Pollack, 1148 Manor Ave., New York, N. Y., in I. C. C. Docket No. 27,761 American Valve Co., Coxsacksie, N. Y., v. New Haven et al.

Balanced Vibration
Rubber-cushioned Power
SIMPLICITY Gyrating Screens with solid counterbalanced shaft, resilient rubber mounting, completely protected bearings and four-way tension screen cloth, are giving fine performance in accurate screening and economical operation.
Simplicity
SIMPLICITY ENGINEERING CO.
DURAND MICH.
Write for Bulletin.
Double Deck Model "SS" Screen—one of 12 standard sizes available in single, double and triple deck, as well as tandem combinations.
SIMPLICITY ENGINEERING COMPANY
DURAND ∴ ∴ MICHIGAN

New Machinery and Supplies

Numerous Improvements in Newest Lime Hydrators

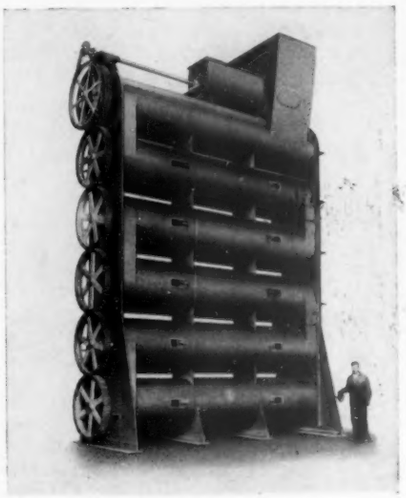
The Kritzer Co., Long Island City, N. Y., maker of lime-plant equipment, is now building the Kritzer hydrator in two sizes, both continuous hydrators of 6-cylinder design with pre-hydrating attachment. The smaller No. 4 model has a capacity of 2½-5 tons, the larger 10-15 tons.

These latest hydrators are structurally different from the earlier type in that they are built of boiler plate which is bolted and welded into a rigid whole.

Accessibility of the paddle shafts has been improved. In the old type it was necessary to remove a cast-iron heading from two cylinders in order to get at the paddles in one cylinder. In the new type a plate is removed from each separate cylinder which only has to be unbolted and the shaft can then be easily removed, thus exposing the paddles.

The new hydrators are equipped throughout with roller bearings; in fact it is claimed that the entire hydrator can be turned by hand, even the larger model, because of the roller action. Under full load the large hydrator does not draw more than 10 amperes of current which is equivalent to approximately 10 hp.

One of the most modern additions is the pre-hydrator which operates at a much faster speed than the main paddle shafts, the ratio being approximately 5 to 1. The purpose of this pre-hydrator is to bring the water into contact with the lime as promptly as possible and to insure a more thorough mixing. Also there is a tendency for the fast-acting particles of a particular lime to be immediately forced on through the hydrator and at the same time

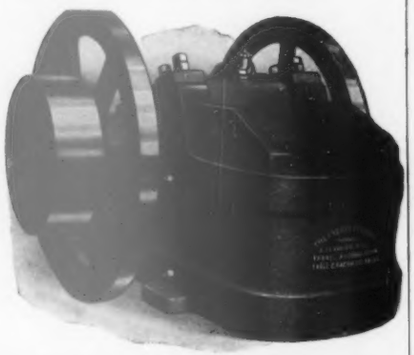


Six-cylinder lime hydrator.

the slower acting lime is retarded until thorough hydration has set in. There are also retarding plates placed at the end of each cylinder which tend to hold up the lime which is not yet completely hydrated. These features insure a thoroughly hydrated lime with a maximum of superfines.

BACON FARREL CRUSHERS

Complete Plants Designed and Equipped. Screens, Elevators, Conveyors, Quarry, Sand and Gravel Plant Equipment. Engineering Service.



EARLE C. BACON, Inc.
17 John Street New York, N. Y.

Kyle Hoist Now Offered for General-Utility Truck Bodies

The Kyle Sales Co., Decatur, Ill., announces that there is now available a Kyle truck-body hoist for general-utility truck bodies. A truck fitted with this equipment becomes an all-purpose unit for hauling coal, gravel, livestock, grain, merchandise or any other commodity. When the hoist is not in use, the truck bed is securely locked in place.

The lifting action of the hoist is accomplished by means of segmented jacks which lock into rigid struts or tension members; they are unwrapped, section by section, from the triplex pin spiders. The power of the jacks is the same in either tension or compression, and they automatically lock the body in any position. Thus the unit can be used not only to elevate the body and load, but also as a hoisting mechanism. The hoist is driven from a conventional power take-off applied to the transmission through two universal joints to a bronze worm reduction gear. A hand hoist of the same type is available, which has no worm gear, but is locked with pawls rather than the worm. Application of the Kyle hoist is easy on any type of bed.

This hoist is light in weight. Lifting pressure is applied close to the front end of the

Lifting is accomplished by segmented jacks.

body in all positions, so that distorting forces applied to the body are reduced to a minimum. Thus much lighter body construction is possible.

New Compressor Built for Continuous Heavy Duty

The new Sullivan Class WN-112 compressor, in displacement sizes of 378, 480, 642, and 800 cu. ft. per min., is claimed to have great economy of power, maintenance, investment, installation and space. The most advanced design, with the use of modern alloys and precision manufacture, make the performance of this new industrial compressor outstanding. It is a continuous, heavy-duty machine which, while built for any type drive, reaches its greatest efficiency with the built-in motor. Thus equipped it requires only 6 ft. by 8 ft. floor space for any of the above capacities.

Vacuum pumps, boosters for steam or gas and low or high pressure machines are available in this new type of construction. Test units have been in actual factory service for over a year and remarkable performance is reported. The compressor is equipped with the new "dual-cushion" valves, a feature recently perfected by Sullivan engineers.

Mobile Compressor Is Automatic in Operation

The Hardsocg Little Wonder compressor of the Hardsocg Wonder Drill Co., Ottumwa, Ia., is a simple and mobile unit employed for sand blasting, paint spraying, rock or coal drilling, paving breaking, and the like. Its speed, capacity and delivery are easily adjusted in full view of the pressure gage so that its running conditions may be set for greatest economy, its limits being 60 cu. ft. of air and 110 lb. delivery pressure. Its capacity at 1,500

r.p.m. is 55 cu. ft. actual delivery at 80 lb. pressure.

When once set, it maintains the desired pressure, cutting out and idling when that pressure is reached, and is automatic, needing no

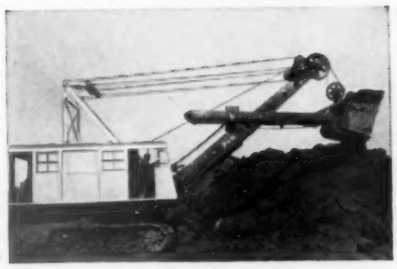
Trailer-mounted compressor unit.

attention. Its gasoline consumption is about 1 gal. per hr.

The Little Wonder compressor is in trailer form for ease of transportation and can be moved at automobile speeds. One man can easily move it on level ground. It can also be had mounted on skids when so desired.

Combustion Engineering Co., Inc., New York, has just issued a 16-page catalog describing and illustrating the principle of controlled circulation as embodied in the Nuway firetube boiler. In this boiler an arrangement of tubes and baffles provides a definite path of circulation, both downward and upward, and thus avoids the existence of inactive areas. The catalog also describes construction details, includes setting drawings and tables of dimensions, and shows how the Elesco girth type of superheater can readily be attached.

The Iron & Steel Products, Inc., now located in the Railway Exchange Building in Chicago, is moving its offices on or about July 17 to its plant at 135th & the C. S. S. & S. B. Rwy., in Hegewisch, (a suburb of Chicago) Ill. The plant was purchased from the Ryan Car Co., and covers some 27 acres in the Calumet district. It has been so arranged that it can accommodate the storage of railway rolling equipment together with machinery of all kinds on a large scale.



P&H Model 855 2-cu. yd. excavator.

All-Welded Construction In New 2-Cu. Yd. Excavator

Harnischfeger Corp., Milwaukee, announces a new P&H Model 855 in its line of "Pacemakers." The first 2-cu. yd. excavator built with all-welded construction of new alloy steels, the 855 claims greater strength and rigidity with less weight. It is fully convertible as shovel, dragline, crane or clamshell. Standard "live" shovel boom is 25 ft. long and fitted with large boom-point sheave. Dragline boom is 60 ft. long—built in two sections. As dragline it accommodates shoes of from 24 in. to 36 in. in width. To further reduce ground pressure, when particularly soft ground is encountered, provision has been made for removing the corduroy frames and extending the length of the crawlers.

The 855 is powered by an 8-cylinder Fairbanks-Morse Diesel engine, or gas or electric power if required, and incorporates split-second clutches, double sprocket drive, rapid reversing planetary chain crowd, and a speedy swing mechanism. It has a hoistline speed of 141 f.p.m. and a pull of 26,000 lb.

New Installation Plan For Scales Announced

The Buffalo Scale Co., Buffalo, N. Y. announces a new plan for the immediate installation of new truck scales with low cash outlays as a helpful aid in meeting present-day higher operating costs, increased sales volume, narrowing net profit margins, together with the very definite trend toward delivering by weight instead of by bulk.

The increasing use of heavy trucks, combining high tonnages, sudden starting and stopping shocks on the scales and other operating and management factors, has created a demand for new scale equipment to meet present-day conditions in the gravel field.

"Naturally the purchase of a new scale is a capital investment and this Buffalo plan is

A Haiss Belt Conveyor in its class

is just as outstanding in quality as a Haiss Loader. SEE BULLETIN 1127 for proof of its simple, strong, HIGH GRADE construction—at a price you can afford. Low receiving end is ideal for unloading hopper-bottom cars.

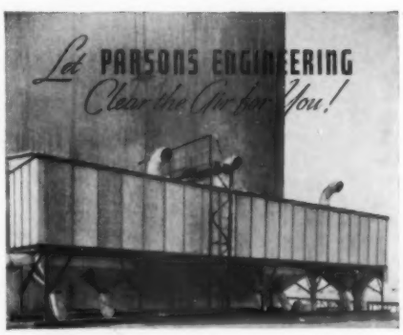
Ask for the bulletin.

Any Length to 60 Feet

WRITE, WIRE OR PHONE

HAISS

GEORGE HAISS MFG. CO., Inc.
142nd St. & Rider Ave., New York
Who, for over 40 years, have created and sold none but equipment of demonstrable superiority in design and manufacture.
Bucket Loaders—Clamshell Buckets



A 15-year record of repeat business would imply that sound Parsons engineering is worthy of *your* investigation, too. Parsons' patented oval bag principle, long life, low dust count and minimum maintenance enable Parsons Dust Arrestors to excel in the cement industry. Write for our Bulletin DA-6.

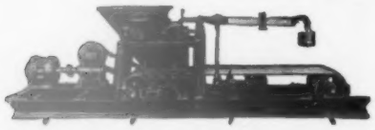
PARSONS

PARSONS
ENGINEERING CORPORATION
3597 E. 82nd St. • Cleveland, Ohio

PERFORATED METAL SCREENS
FOR SAND, GRAVEL STONE, ETC.
Manufactured exactly to your specifications.
Any size or style screen, in thickness of steel wanted with any size perforation desired.
We can promptly duplicate your present screens at lowest prices.
Prompt Shipment
CHICAGO PERFORATING CO.
2435 W. 24TH PLACE CHICAGO, ILL.
Telephone CANAL 1459

MATERIAL weighed and proportioned with

99% Accuracy



Weighing and proportioning material with 99% accuracy, Schaffer Poidometers are recognized throughout the cement industry as important equipment in modern plant control.

Schaffer Poidometers are automatic in action and will operate continuously or, with a mechanical weighmaster attachment, will provide batch operation.

This efficient weighing equipment is now saving thousands of dollars throughout the cement industry. Many leading plants are now saving money while obtaining greater efficiency with Schaffer Poidometers. Let us help solve your proportioning and feeding problems. *Write for catalog No. 5.*

SCHAFFER POIDOMETER COMPANY
2828 Smallman Street Pittsburgh, Pa.

SCHAFFER POIDOMETERS

F. C. Mertz and Son of Port Chester, N. Y., employ this new model BM Mack six-wheeler truck for delivering mixed concrete to builders. Equipped with a Rex motor-mixer, driven by a separate engine and of 4 to 4½ cu. yd. capacity, this unit mixes concrete in transit and thereby saves builders added time and labor.

being featured as a contribution to the industry which will be helpful in accurately weighing deliveries and at the same time distributing the cash outlay over a period of time," stated Theodore L. Richmond, Jr., president of the Buffalo Scale Co. "Actually we have taken a leaf from the Motor Truck Manufacturers' book and applied it to the scale industry. The Buffalo plan provides modern, accurate scale equipment for immediate installation and at the same time leaves necessary working capital available for handling increased business."

"Nite-Cap" Is Knitted Hood for Respirators

The H. S. Cover "Nite-Cap" is a protective knitted hood, made of a fuzzy, sock-like material, that can be drawn snugly over the filter apertures of a respirator to keep filter pads free of excessive dust cake or accumulation and save clogging. Where dust cake and moisture from breathing start to form a mud-pie-like substance on a Nite-cap, all the wearer need do is remove it and shake free. Elastic edge of Nite-cap makes it easy to slip on or take off whenever desired.

Nite-cap for respirator.

These filter pad protectors were originally designed for Cover's Dupor plate respirator No. 24. However, it is possible to use them on any respirator that has a round flat aperture for holding filter pads.

For all Purposes

LESCHEN WIRE ROPE

"HERCULES" RED STRAND WIRE ROPE

ESTABLISHED 1857

A. Leschen & Sons Rope Co.
5909 Kennerly Avenue
ST. LOUIS, MO.
New York—87 to 90 West Street
Chicago—810 W. Washington Boulevard
Denver—1554 Wazee Street
San Francisco—520 Fourth Street
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Round Strand
•
Flattened Strand "P. F. S."
•
Non-Rotating
•
Preformed
•
Steel Clad
•
Locked Coil
•
Regular Lay
•
Lang's Lay
•
Hemp Center
•
Wire Rope Center
•
Metallic Core
•
Seale-Filler Wire
Warrington

Method of Separating Soft Stone Patented

A method of separating hard stone from shale or other soft material during the screening process has been perfected and patented by Frank A. Slater, general manager of the Standard Gravel Co., Pontiac, Mich. After a long try-out period in his own plant, Mr. Slater is preparing to market the device.

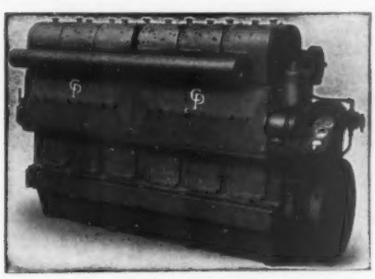
The process consists of passing the material along an apertured apron which is inclined and made to vibrate rapidly. Hard material rebounds higher than the soft, with the result that the hard stone escapes over the lower end of the apron while the soft material, not bounding so high, passes downward through openings between the slats.

A gravel with 50 per cent. hard pebbles and an equal amount of shale or soft pebbles has its shale content reduced to 3 per cent. by one pass along an apron made of hard steel slate 2 in. wide and 24 in. long, according to Mr. Slater.

There is no appreciable loss through breakage, and the power consumption is said to be about the same as that of an ordinary gravel screen of the same capacity. The machines will be supplied to the trade in the form of attachments to commercial gravel screens,

Medium-Speed Diesel Engine Announced

Chicago Pneumatic Tool Co., New York, N. Y., announces a new Type 8 CP Diesel engine, in four models, now in production and ready for delivery. The engine is of the four-cycle, direct-injection type, especially designed for medium speed and continuous duty. It is offered for such typical applications as generator drives, power drives, compressor drives,



Type 8 CP Diesel Engine.

locomotives, shovels, and specialized uses in various industries.

Salient features set forth by the manufacturer include fuel economy equalling that of large, low-speed Diesels, complete enclosure of all wearing parts, positive and automatic lubrication, simple fuel system, and instant starting.

Cement-Kiln Technique Applied to Lime Kilns

The present activity in the steel industry, in many chemical industries and in the building trade, has renewed considerable interest in the rotary kiln for the burning of lime and dolomite. The fuel cost is ordinarily by far the most important item in the manufacturing cost of lime and dolomite products and a wider use of the modern, efficient type of rotary kiln is therefore of great importance to the industry.

It is fortunate that there is a decided similarity between the burning of cement and the burning of lime and dolomite, as thereby it becomes possible to take advantage of the extensive development of the rotary cement kiln which has taken place during the past 15 years. While 15 years ago a 150-ft. cement kiln was still considered a large unit, now kilns of much greater length are in operation and have proved very advantageous both from a quality and a cost point of view. A similar development may be expected in the near future as far as the burning of lime and dolomite is concerned.

More Yardage... More Profit... FROM YOUR DRAGLINE MACHINE with a PAGE AUTOMATIC BUCKET

Users Report 20% to 50% Increased Yardage—Read What They Say: . . .

One AUTOMATIC user writes:

"We were amazed at the way the AUTOMATIC Bucket handled the hard material, especially on the slopes. We feel sure that we can figure an increase of 25% in yardage with the AUTOMATIC."

A Contractor reports:

"Since putting on your AUTOMATIC, we are stripping 50% more material."

**From letters in our files.*

You, also, can increase dragline yardage and profit, with a patented rounded front Page AUTOMATIC. Your equipment dealer will gladly recommend an AUTOMATIC best suited for your machine and job—or write us direct.

BUILT IN SIZES 3/8 to 15 CUBIC YARDS

"Dig With a Page Automatic"

PAGE ENGINEERING COMPANY

CLEARING POST OFFICE CHICAGO, ILLINOIS

The transfer of the heat from the combustion of the fuel to the material in a rotary kiln is influenced by the following three main factors: (1) The difference in temperature of the gases and the material; (2) the time element; (3) the surface exposed.

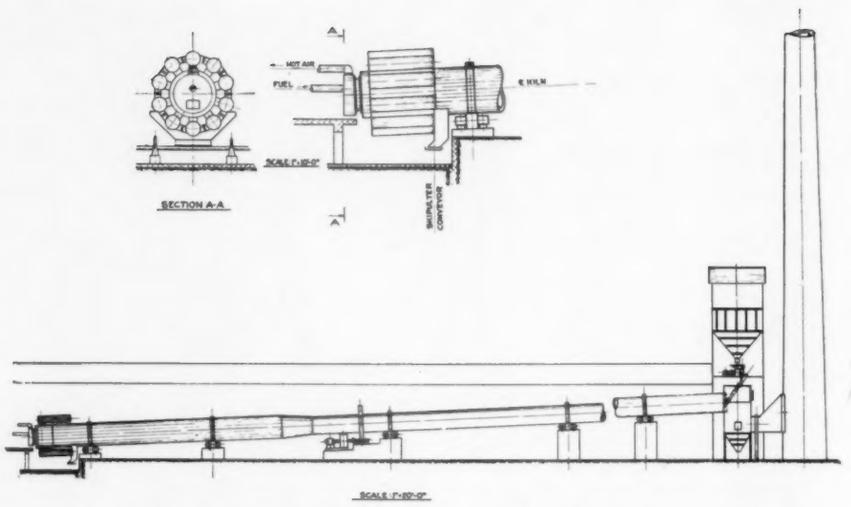
Not only undesirable from an economical standpoint, excessive fuel consumption is actually harmful to the quality of the product, partly due to overburning and partly on account of contamination of the product with coal ash if coal is used as fuel. Furthermore, excessive fuel consumption will aggravate any tendency towards ring formation in the kiln. Increased fuel efficiency is therefore of great importance in that it will not only decrease the manufacturing cost but will improve the quality of the product.

Unsatisfactory fuel efficiency of a rotary kiln may as a rule be ascribed to one or more of the following factors: (1) Excessive stack gas temperature; (2) inefficient recuperation of heat while cooling the calcined material; (3) improper combustion of the fuel; (4) excessive radiation loss.

Careful consideration of these factors has been given by F. L. Smidth & Co., in its design of the Unax kiln as originally developed for cement burning but now adapted for burning and calcination of many other materials. The special shape and great length of these kilns assures a slow and "soft" calcination of the lime and a low stack gas temperature. Special heat exchangers may be installed in the feed end of the kiln to facilitate the heat transfer and to increase the exposed surface of the raw material.

The Unax cooler, integral with the kiln, provides for cooling of the calcined material by means of the air for combustion which thereby becomes preheated to a high degree. The gentle conveying of the material in the Unax cooler is of particular importance for lime burning as breakage is avoided and practically no dust is returned to the kiln.

The Unax kiln offers good burning conditions, either with natural draft or with induced draft, and by means of the F. L. S. gas analyzer it is an easy matter to obtain complete combustion of the fuel and yet avoid excess air through the kiln. Excessive heat loss by radiation is avoided by proper insulation between the kiln shell and refractories.



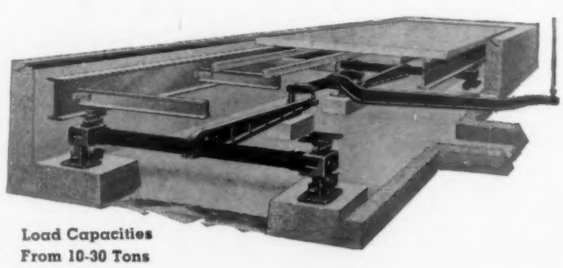
Cement-type kiln and cooler adapted for lime and dolomite.

Why Ball-Protected Bearings Save You Weight Losses

As truck loads of stone, sand, gravel or other non-metallic mineral products pass over your scale, there is a constant sifting, clinging of silt and dust to the vital scale parts—a cause of added friction and a challenge to the accuracy of your weighing.

The HOWE Standard Motor Truck Scale defies friction with its simple, powerful lever system and minimum number of moving parts under the platform (only 15). Fewer moving parts mean less friction; less friction means longer periods of sustained accuracy.

This is only one vital feature that has given the HOWE Standard Motor Truck Scale its reputation for accuracy over a period of 80 years. Ask our representative about other features, including Ball-Bearing protection of scale pivots; or write to The Howe Scale Company, Dep't P-7, Rutland, Vermont.



Load Capacities
From 10-30 Tons

HOWE Scales
HOWE FAMOUS FIRST IN 1857

BRANCHES and WAREHOUSES in PRINCIPAL CITIES

Trade Notes

General Refractories Co. announces the appointment of the Tennessee Mill & Mine Supply Co., Knoxville, Tenn., as distributor in the Knoxville area. Tennessee Mill & Mine Supply Co. will carry a complete stock of refractories.

The New York Belting & Packing Co., Passaic, N. J., announces the appointment of the Eckerly-Johnson Co., Broad and 13th Sts., Chattanooga, Tenn., as distributors of the complete line of N. Y. B. & P. mechanical rubber goods in the Chattanooga district.

W. S. Yates Associates, Chicago, Ill., have been appointed to handle the sale of all products of the Audubon Wire Cloth Corp. in the Chicago district.

Markley Dust Control System, Inc., announces the removal of its office to 61 Broadway, New York, N. Y.

The opening of two new rod mills by the American Steel & Wire Co. at Joliet, Ill., was celebrated on June 23 with appropriate ceremonies. The new mills are "continuous," that is, the billet passes through them in a straight line from the roughing mill to the last finishing strand.

The Buffalo Scale, Buffalo, N. Y., announces the appointment of E. J. Kelly, 2010 Locust St., St. Louis Mo., as distributor for the complete line of Buffalo scales. His territory includes Missouri and southern Illinois.

The Gates Rubber Co. announces that it has moved its regional sales office and warehouse to new and larger quarters at 1500 S. Western Ave., Room 306-B, Chicago, Ill.

The general offices and plant of the Parsons Engineering Corp., Cleveland, O., have been moved to larger quarters at 3589 East 82d St.

The Chain Belt Co., Milwaukee, Wis., announces the appointment of B. E. Sivyer, Jr., as branch manager of the company's San Francisco office to succeed the late G. E. Taylor.

Incorporations

NATURAL MARBLE & ONYX CORP., New York, N. Y. 50 shares n.p.v. Correspondent: Philip Handelman, 9 E. 40th St., New York, N. Y.

THE INSTONE CO., 4543 Torrence Ave., Hammond, Ind. 10,000 shares $5 p.v. Resident agent: Myron W. Bradbyer, 43 Warren St., Hammond. Concrete products and building materials.

NEW YORK SLAG CORP. 200 shares n.p.v. Correspondent: Meltz & Berkman, 89-39 163rd St., Jamaica, L. I., N. Y.

STONE PRODUCTS CO., 165 W. Wacker Drive, Chicago, Ill. 10,000 shares n.p.v. Correspondent: Isham, Lincoln and Beale, 72 W. Adams St., Chicago, Ill.

MONTICELLO QUARRIES, INC., Washington, Pa. Capital $100,000 Harry B. Monticello, D. I. McAlister and George H. Krause.

THE MARBLESTONE QUARRIES, Lannon, Wis., E. Orlow, J. T. Thompson and A. P. Fritsch.

THE KASOTA STONE QUARRIES, INC., Minneapolis, Minn., J. M. Shelly, 2727 27th Ave.; F. M. Fudali, 2727 27th Ave., and S. M. McNamara, 610 McKnight Bldg., Minneapolis.

Trade Literature

P & H 855 High-Speed 2-yd. Excavator. 16 p. Harnischfeger Corp., Milwaukee, Wis.

Type 8 CP Diesel Engine for Continuous Heavy Duty. 8 p. Chicago Pneumatic Tool Co., New York, N. Y.

Long Range Machines for Excavating, Conveying, Storing and Reclaiming (Catalog No. 18). 84 p. Sauerman Bros., Inc., Chicago, Ill.

Austin-Western 5-Yard Tractor Scraper (Bulletin 1680). 8 p. Austin-Western Road Machinery Co., Aurora, Ill.

Cedar Rapids Portable Mixing Plants. 8 p. Iowa Mfg. Co., Cedar Rapids, Ia.

Super 40 Roll Crusher. 4 p. Pioneer Gravel Equipment Mfg. Co., Minneapolis, Minn.

Good Roads Machinery for Rock Quarries and Sand and Gravel Pits. 32 p. Good Roads Machinery Corp., Kennett Square, Pa.

Worthington Mine Pumps. (Folder.) Worthington Pump and Machinery Corp., Harrison, N. J.

Century Direct Current Motors. 8 p. Century Electric Co., St. Louis, Mo.

Century Slip Ring Motors. 8 p. Century Electric Co., St. Louis, Mo.

Patterson Machinery for Clay and Mineral Working Plants (Catalog No. 371). 96 p. The Patterson Foundry & Machine Co., East Liverpool, O.

Road, Pit and Quarry Equipment. 48 p. Wisconsin Foundry & Machine Co., Madison, Wis.

Acid and Water in Fuel is Cutting the Heart Out of Your Diesel. (Fuel dehydrator.) Folder. Cunningham Co., Los Angeles, Cal.

LeTourneau Angledozer. (Folder.) R. G. LeTourneau, Inc., Peoria, Ill.; Stockton, Cal.

LeTourneau Bulldozers. (Folder.) R. G. LeTourneau, Inc., Peoria, Ill.; Stockton, Cal.

Barber-Greene Standardized Belt Conveyors. (P. 1-319, not continuous.) Barber-Greene Co., Aurora, Ill.

Cedar Rapids Washing Plants. Iowa Mfg. Co., Cedar Rapids, Ia.

Bulletin No. 13 (surplus equipment). (Folder.) Mid-Continent Equipment Co., St. Louis, Mo.

The Diesel Engine Type "S". 24 p. Ingersoll-Rand, New York, N. Y.

The Diesel Engine, Stationary Type. 20 p. Ingersoll-Rand, New York, N. Y.

Raymond Imp Mill (Bulletin No. 31). 8 p. Raymond Pulverizer Division, Combustion Engineering Co., Inc., Chicago, Ill.

V-Belt Replacements (Rockwood Single Groove V-Belt Drives). 32 p. Rockwood Mfg. Co., Indianapolis, Ind.

American Hammermills for Greater Tonnage at Lower Cost. 4 p. American Pulverizer Co., St. Louis, Mo.

Cutting Costs Handling Concrete and Aggregates With Belt Conveyors. (Folder). Portable Machinery Co., York, Pa.

Arranged to show at a glance the wide range of pumping and other mining equipment built by Worthington Pump and Machinery Corp., Harrison, N. J., is a 6-p. bulletin (WP-1092) recently issued by this manufacturer. It is illustrated and contains data regarding capacities and heads of pumps for drainage, sump, sinking, tunnelling and gathering services.

In addition to pump information, views of other mining equipment, including a V-belt drive, Diesel engine, concrete breaker, wagon drill and portable and stationary compressors are shown.

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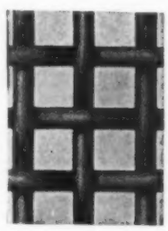

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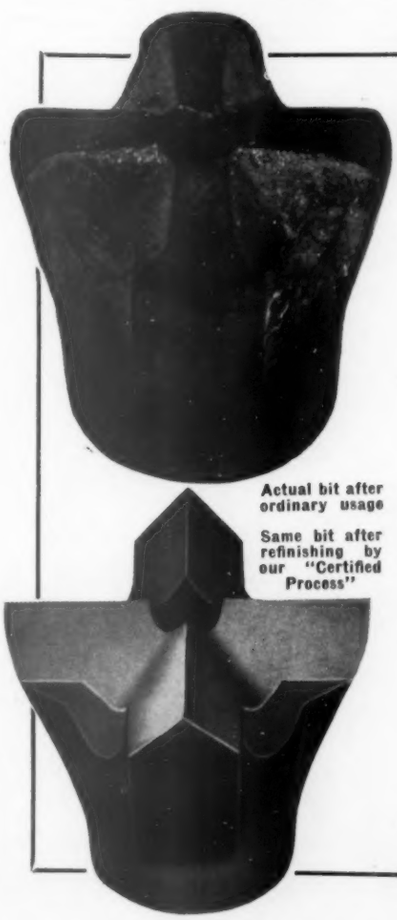

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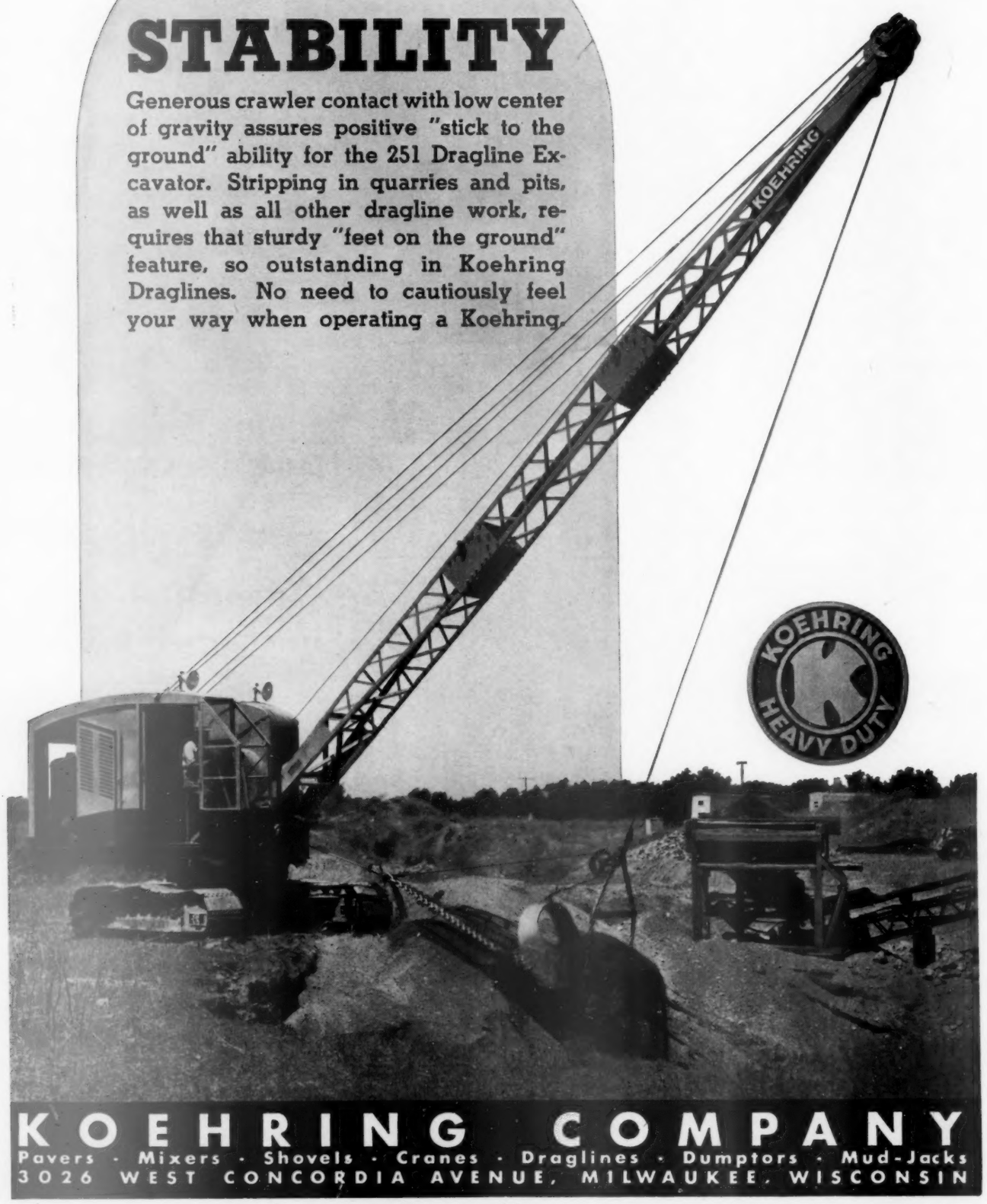

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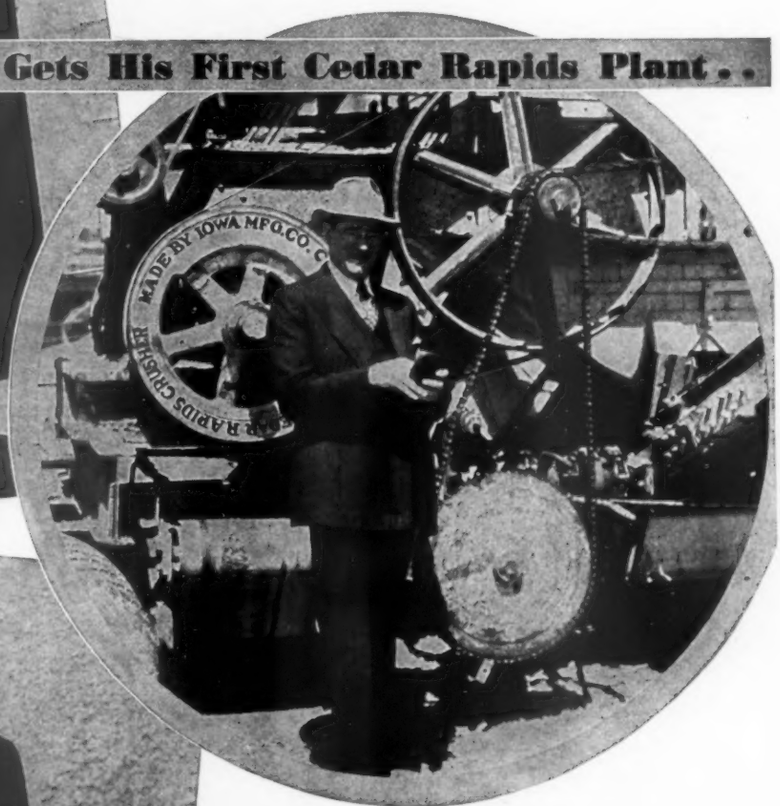

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BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified

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*Chain Belt Co.
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Iowa Mfg. Co.
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*Link-Belt Co.

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*Hardinge Co.
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Simplicity Engr. Co.

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Universal Concrete Pipe Co

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Bartlett & Snow Co., C. O.
*Chain Belt Co.
Haiss Mfg. Co., Geo.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
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BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Haiss Mfg. Co., Geo.
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*Robins Conveying Belt Co.
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*Bucyrus-Erie Co.
Frog Switch & Mfg. Co.
*Koehring Co.

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*Good Roads Machinery Co.
*Link-Belt Co.
Page Engr. Co.
*Sauerman Bros., Inc.

Dragline Excavators
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*Harnischfeger Corp.
*Koehring Co.
*Lima Locomotive Works, Inc.
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Drill Bits
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Timken Roller Bearing Co.

Drilling Contractors
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
*Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.
Gardner-Denver Co.
Independent Pneumatic Tool Co.

Drills (Core)
Hoffman Bros. Drilling Co.
*Ingersoll-Rand Co.
Pennsylvania Drilling Co.

Drills (Diamond)
*Chicago Pneumatic Tool Co.
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Hand-Hammer)
*Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.
Gardner-Denver Co.
Independent Pneumatic Tool Co.
*Ingersoll-Rand Co.

Drills (Rock)
*Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.
Gardner-Denver Co.
Hardsocg Wonder Drill Co.
*Ingersoll-Rand Co.
*Jeffrey Mfg. Co.

Drill Sharpening Machinery
Gardner-Denver Co.
*Ingersoll-Rand Co.

Drill Steel
*Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.
Independent Pneumatic Tool Co.
*Ingersoll-Rand Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple, Belt, Chain, Rope)
*Allis-Chalmers Mfg. Co.
*Chain Belt Co.

Dryers
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mch. Co.
McLanahan and Stone Corp.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Dust Arresters
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corporation
*Parsons Engineering Corp.
*Western Precipitation Corp.

Dust Collecting Systems
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*Blaw-Knox Co.
Dracco Corporation
*Parsons Engineering Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Western Precipitation Corp.

Dust Conveying Systems
Allen-Sherman-Hoff Co.
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corporation
*Fuller Company
*Parsons Engineering Corp.
*Western Precipitation Corp

Dust Filters
*Parsons Engineering Corp.
*Western Precipitation Corp

Dust Handling Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Dynamite (See Explosives)

Electrical Equipment
*Allis-Chalmers Mfg. Co.
*General Electric Co.

Electrodes (Welding)
Stulz-Sickles Co.

Elevator Belting (See Belting)

Elevators (See Conveyors and Elevators)

Eliminators (Soft Stone) (See Soft Stone Eliminators)

Engineers
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Bonnot Co.
Burrell Eng. & Const. Co.
*Fuller Company
Hetherington & Berner, Inc.
Holmes & Bros., Inc., Robt.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
*Sprout, Waldron & Co.
Sturtevant Mill Co.
*Traylor Engr. & Mfg. Co.

Engine Generator Sets
See Generator Sets (Engine).

Engines (Diesel)
Caterpillar Tractor Co.
*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.
National Supply Co. of Dela.
*Nordberg Mfg. Co.
Page Engr. Co.

Engines (Internal-Combustion)
Caterpillar Tractor Co.
*Chicago Pneumatic Tool Co.
*Ingersoll-Rand Co.
National Supply Co. of Dela.
*Nordberg Mfg. Co.
Page Engr. Co.

Engines (Steam)
*Ingersoll-Rand Co.
*Morris Machine Works
*Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets, etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
Haiss Mfg. Co., Geo.

Fabricating (Electric Arc and Oxy-Acetylene)
Smith Co., S. Morgan
Stulz-Sickles Co.

Fans (Exhaust)
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
Bonnot Co.
*Chain Belt Co.
*Fuller Company
*Good Roads Machinery Corp.
*Hardinge Co.
*Huron Industries Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.
Universal Crusher Co.

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Forges (Oil)
Gardner-Denver Co.

Fuses (Detonating)
*Ensign-Bickford Co.

Fuses (Electric)
*General Electric Co.

Gaskets
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Gasoline Engines (See Engines—Internal-Combustion)

Gas Producers
Wellman Engr. Co.

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
Haiss Mfg. Co., Geo.
*Link-Belt Co.

Gears (Herringbone)
Bartlett & Snow Co., C. O.
*Chain Belt Co.

* See also information in the 1937 Pit and Quarry HANDBOOK.

GAR WOOD

Heavy Duty Dump Bodies
for *Rock* and *Aggregates*
and T44 TELESCOPIC HOISTS with
PATENTED OUTSIDE MOUNTINGS

● 20 cu. yd. side dump body, and Model T44 telescopic hoist. The body weighs approximately 14,000 lbs.

● Model T44 consists of two powerful telescopic hoists mounted in saddles inside or outside the truck frame. It is extensively used with big rock bodies such as the one opposite, to handle up to 25 tons.

● Fleet of rock excavating units, with T44 hoists. This type of body can be furnished with down-folding tailgate as shown, or with scoop end.

GAR WOOD INDUSTRIES, INC.
7924 Riopelle St. • Detroit, Mich.
WORLD'S LARGEST MANUFACTURER OF TRUCK EQUIPMENT — Hoists, Bodies, Tanks, Winches and Cranes
Also: Trailbuilders, Bulldozers and Hydraulic Scrapers

For better compressor performance

A GARDNER-DENVER AIR COMPRESSOR

- **An improved, accurately balanced compressor suitable for a wide variety of services.**
- **Made in all commercial sizes.**
- **Rugged—built for heavy-duty, full-load service and continuous operation.**
- **Low power costs . . . electro pneumatic control automatically controls current consumption in accordance with air demand.**
- **Timken Tapered Adjustable Roller Bearings.**

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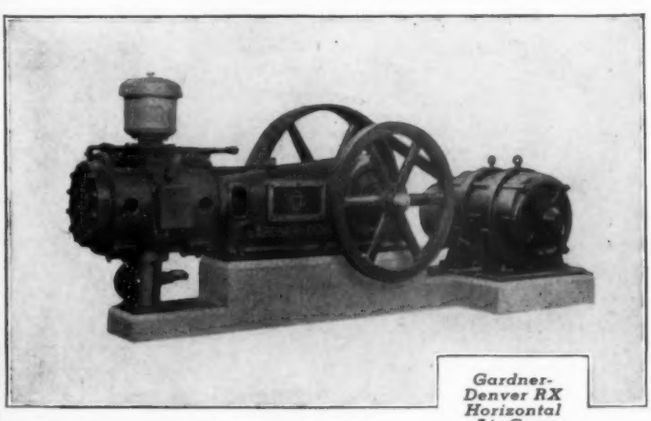

Gardner-Denver RX Horizontal Air Compressor

★

Since 1859

GARDNER-DENVER COMPANY
Quincy, Illinois

GARDNER-DENVER

BUYERS' GUIDE

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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Sprout, Waldron & Co.

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*Link-Belt Co.
*Sprout, Waldron & Co.

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*Hendrick Mfg. Co.
*Huron Industries Co.
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*Jaeger Machine Co.
*Jeffrey Mfg. Co.
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*Sauerman Bros., Inc.
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*Sprout, Waldron & Co.

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*Hendrick Mfg. Co.
*Link-Belt Co.

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*Chicago Pneumatic Tool Co.
*Cincinnati Rubber Mfg. Co.
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Independent Pneumatic Tool Co.
*Ingersoll-Rand Co.
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Republic Rubber Co.

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*Barber-Greene Co.
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*Chain Belt Co.
*Good Roads Machinery Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
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*Sprout, Waldron & Co.

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*Allis-Chalmers Mfg. Co.
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*Hardinge Co.
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*Traylor Engr. & Mfg. Co.

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*Hardinge Co.

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*General Electric Co.

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*Hardinge Co.
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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Robins Conveying Belt Co.

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*Jeffrey Mfg. Co.
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*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

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*Whitcomb Locomotive Co.

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*General Electric Co.
*Whitcomb Locomotive Co.

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*General Electric Co.
*Lima Locomotive Works, Inc.
*Whitcomb Locomotive Co., The

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*General Electric Co.
*Whitcomb Locomotive Co.

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*General Electric Co.
*Whitcomb Locomotive Co.

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*General Electric Co.
*Jeffrey Mfg. Co.

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Manganese Steel Forge Co.

Manganese Steel Castings
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Frog Switch & Mfg. Co.
Manganese Steel Forge Co.

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Measuring Devices (Electric)
*General Electric Co.

Mechanical Rubber Goods
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Mill Liners and Linings
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
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*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

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*Allis-Chalmers Mfg. Co.
*Hardinge Co.
*Traylor Engr. & Mfg. Co.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mch. Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Smidth & Co., F. L.
*Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

Motors and Generators
*Allis-Chalmers Mfg. Co.
*General Electric Co.
*Harnischfeger Corp.

Motors (Internal-Combustion) (See Engines — Internal-Combustion)

Motor Trucks (Dual Rear Axle Drive Units)
General Motors Corp.
Hug Company

Netting (Locomotive Stack)
*Tyler Co., W. S.

Nozzles (Gravel Washing)
*Chain Belt Co.
*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Chain Belt Co.
*Deister Concentrator Co.

Packings
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co
Republic Rubber Co.

Partitions (Wire)
National Wire Cloth Co.

Paving Mixers
*Chain Belt Co.
*Jaeger Machine Co.
*Koehring Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Sprout, Waldron & Co.

Pipe, Dredge (Floating and Shore)
Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

Pipe Forms (Concrete)
Quinn Wire & Iron Works
Universal Concrete Pipe Co.

Pipe Machines (Concrete)
Quinn Wire & Iron Works
Universal Concrete Pipe Co.

Pipe (Welded)
Taylor Forge & Pipe Co.

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Pneumatic Conveying Systems (See Conveyors—Pneumatic)

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Poidometers
Schaffer Poidometer Co.

Portable Conveyors
*Barber-Greene Co.
*Fuller Company
Haiss Mfg. Co., Geo.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Portable Crushing and Screening Plants
*Barber-Greene Co.
Bartlett & Snow Co., C. O.
*Good Roads Machinery Corp.
*Gruendler Crusher & Pulverizer Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Power Shovels (See Shovels, Electric, Internal-Combustion and Steam)

Precipitators
*Western Precipitation Corp.

Pre-formed Wire Rope
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of the American Chain & Cable Co., Inc.
*Leschen & Sons Rope Co., A.
*Roebling's Sons Co., John A.
Williamsport Wire Rope Co.

Proportioning Equipment
*Blaw-Knox Co.
*Jaeger Machine Co.
Schaffer Poidometer Co.

Pulleys
*Huron Industries Co.
Sprout, Waldron & Co.

Pulleys (Magnetic)
*Sprout, Waldron & Co.

Pulleys (Wing)
*Sprout, Waldron & Co.

Pulverized Fuel Systems
Bartlett & Snow Co., C. O.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.

Pulverizers (See also Crushers, Mills, etc.)
*American Pulverizer Co.
Bartlett & Snow Co., C. O.
Bonnot Co.
*Gruendler Crusher & Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
New Holland Machine Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Smidth & Co., F. L.
Sturtevant Mill Co.
Traylor Engr. & Mfg. Co.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

Pump Valves (See Valves, Pump)

Pumps (Air-Lift)
*Chicago Pneumatic Tool Co.
*Fuller Company
*Ingersoll-Rand Co.

Pumps (Bulk Cement)
*Fuller Company

Pumps (Cement Slurry)
Allen-Sherman-Hoff Co.
*Morris Machine Works
*Smidth & Co., F. L.

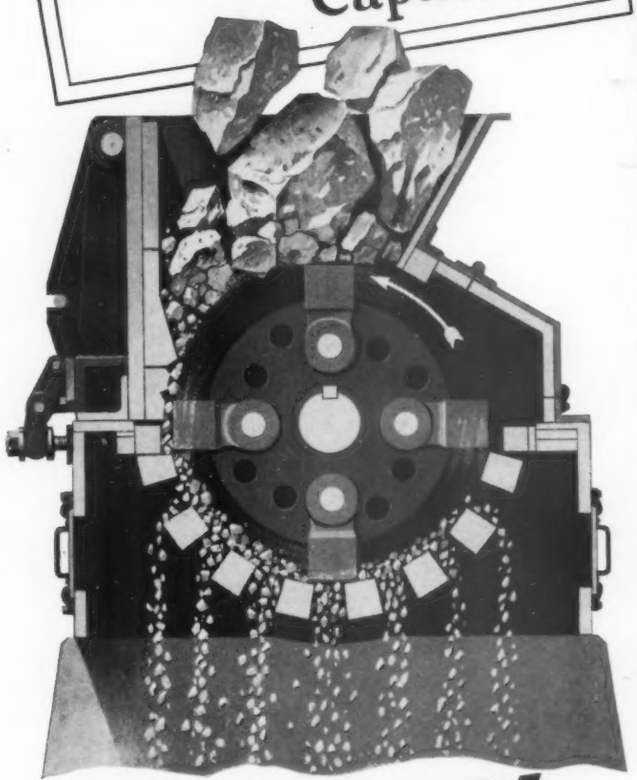
Pumps (Centrifugal)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Chain Belt Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
Independent Pneumatic Tool Co.
*Ingersoll-Rand Co.
*Jaeger Machine Co.
*Morris Machine Works

Pumps (Dredging)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bucyrus-Erie Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
*Morris Machine Works

Pumps (Sand and Gravel)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.

* See also information in the 1937 Pit and Quarry HANDBOOK.

Large Pieces for Large Capacities



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Miracle Hammer CRUSHERS

Reduce large pieces and large capacities of limestone, shale, slag and cement rock. This 'miracle hammer' crusher will take steam shovel size limestone and crush it into pieces 1", 2", 3" or 4" and under, in one operation . . . the one unit doing the work ordinarily done by two or more other types of crushers.

With a minimum initial investment you can reduce material to a uniform size at a lower cost . . . and enlarge your profits.

For reduction machinery . . . call on us.

1877 60 1937

The Jeffrey Manufacturing Company
917-99 North Fourth Street, Columbus, Ohio

BUY THE SHOVEL YOU LIKE *BUT BE SURE THERE'S AN* AMSCO DIPPER ON THE STICK

No matter what shovel you buy—from a small 3/8 yard to the mammoth stripping shovel—*for greatest efficiency, demand that it be fitted with an AMSCO Renewable Lip Dipper.* They're lighter in weight and stronger, have a greater full-measure capacity, load and dump faster, and being made of AMSCO Manganese Steel, "the toughest steel known," last much longer.

AMSCO Renewable Lip Dippers are one of the greatest profit-makers ever offered the shovel operator because they are a means to increased yardage, savings in time and money, and reduced maintenance costs; yet they are applicable to new and old shovels alike.

The AMSCO Renewable Lip Dipper consists of a rugged, cast Manganese Steel body and easily and quickly renewable Manganese Steel Lips. 5/8 yard and smaller sizes do not have the separate lip.

Lips are made in several types, designed for fast digging in different types of material. Body interior is smooth, teeth are placed nearer corners and correctly pitched, integral tooth bases are part of the lip reinforcement. Sharp cutting edges reduce digging resistance.

Don't repair your old dippers forever—you'll save time and money, eliminate trouble and delay, by putting AMSCO Renewable Lip Dippers on every shovel stick! They are available for all makes of power shovels.

Our nearest office, or your shovel manufacturer, will gladly furnish complete details. Get them today!

AMERICAN MANGANESE STEEL COMAPNY
Division of
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396 East 14th Street, Chicago Heights, Ill.
Foundries at
Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.; Los Angeles, Calif.; St. Louis, Mo.
Offices in Principal Cities

LIGHTER
STRONGER
FASTER
GREATER CAPACITY
LONGER LIFE
UTMOST ECONOMY

AMSCO
TRADE MARK REGISTERED

BUYERS' GUIDE

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*Fuller Company

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*Jaeger Machine Co.

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*Chain Belt Co.
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*Link-Belt Co.

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*Jeffrey Mfg. Co.
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*Hardinge Co.

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Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

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Howe Scale Company
Merrick Scale Mfg. Co.

Scales (Track or Truck)
Buffalo Scale Co.
Howe Scale Company
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*Link-Belt Co.
*Sauerman Bros., Inc.

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Bacon, Inc., Earle C.
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*Chain Belt Co.
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*Deister Machine Co.
*Eagle Iron Works
*Good Roads Machinery Corp.
*Gruendler Crusher & Pulverizer Co.
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Universal Road Machy. Co.

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*Huron Industries Co.
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*Sprout, Waldron & Co.
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*Tyler Co., W. S.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

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*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

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*Chain Belt Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Link-Belt Co.
*Jeffrey Mfg. Co.
McLanahan and Stone Corp.
*Sprout, Waldron & Co.

Shovels (Electric, Internal-Combustion and Steam)
*Bucyrus-Erie Co.
*Harnischfeger Corp.
*Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
*Manitowoc Engineering Works
Michigan Power Shovel Co.
Northwest Engr. Co.
Thew Shovel Co., The

Siding (Steel)
Carnegie-Illinois Steel Corp.

Silos
Burrell Eng. & Mfg. Co.
*Chain Belt Co.
Marietta Concrete Corp.
*Smidth & Co., F. L.

Skip Hoists and Skips
*Allis Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
*Chain Belt Co.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Sleeves Dredge
*Cincinnati Rubber Mfg. Co.

Speed Reduction Units
*Chain Belt Co.
*General Electric Co.
*Huron Industries Co.
Iowa Mfg. Co.
*Link-Belt Co.

Spirals (Lowering)
Holmes & Bros., Inc., Robt.

Spouts (See Chutes and Chute Liners)

Sprays
*Deister Concentrator Co.

Sprockets and Chain
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
*Chain Belt Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Sprout, Waldron & Co.

Stackers
*Jeffrey Mfg. Co.

Starters (Automatic, Motor)
*General Electric Co.

Steel (Alloy)
(See Alloys—Steel)

Steel (Bars, Shapes, Plates, Etc.)
Carnegie-Illinois Steel Corp.

Steel Grating (See Grating, Steel)

Steel Plate Construction
Carnegie-Illinois Steel Corp.
Hetherington & Berner, Inc.
Holmes & Bros., Inc., Robt.
*Sprout, Waldron & Co.

Stone Grapples
Owen Bucket Co.

Storage Equipment
Bartlett & Snow Co., C. O.
*Chain Belt Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Marietta Concrete Corp.
*Sauerman Bros., Inc.

Surfacers (Concrete)
Independent Pneumatic Tool Co.

Sweeping Systems
Allen-Sherman-Hoff Co.

Switchboards (Electric)
*General Electric Co.

Switches (Electric)
*General Electric Co.

Switches (Safety)
*General Electric Co.

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Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.
*Link-Belt Co.
*Traylor Engr. & Mfg. Co.

Tanks (Sand-Settling)
Bartlett & Snow Co., C. O.
*Good Roads Machinery Corp.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

Testing Sieves and Shakers
*Hendrick Mfg. Co.
*Tyler Co., N. S.

Thickeners (Slurry)
*Hardinge Co.

Tire Repair Materials
Goodyear Tire & Rubber Co.

Tools (Drill) (See Drilling Accessories)

Track Shifters
*Nordberg Mfg. Co.

Tractors
*Allis-Chalmers Mfg. Co.
Caterpillar Tractor Co.

Trailers
General Motors Corp.
Hug Company

Tramways (Aerial)
*Roebling's Sons Co., John A.

Transformers
*Allis-Chalmers Mfg. Co.
*General Electric Co.

Transmission Belting (See Belting)

Transmission Machinery
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
*Chain Belt Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Trippers
Bartlett & Snow Co., C. O.
*Chain Belt Co.
*Good Roads Machinery Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Truck Cranes (See Cranes)

Truck Mixers
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
*Chain Belt Co.
*Jaeger Machine Co.

Trucks (Hand)
Howe Scale Company

Trucks and Trailers (See Motor Trucks)

Tube-Mills (See Mills—Ball, Tube, etc.)

Tubes (For Tire Casings)
Goodyear Tire & Rubber Co.

Turbines
Smith Co., S. Morgan

Underground Loaders
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.

Unit Heaters
*General Electric Co.

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*Barber-Greene Co.
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*Fuller Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

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*Cincinnati Rubber Mfg. Co.
Taylor Forge & Pipe Works

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*Link-Belt Co.

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Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Vibrating Screens (See Screens—Vibrating)

Vibrators
Independent Pneumatic Tool Co.
*Jeffrey Mfg. Co.
*Tyler Co., W. S.

Wagons (Dump)
*Koehring Co.
Le Tourneau, R. G.

Washers (Sand, Gravel and Stone)
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
*Eagle Iron Works
*Good Roads Machinery Corp.
Haiss Mfg. Co., Geo.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Mach. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Smidth & Co., F. L.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.
Universal Crusher Co.

Weighing Equipment (Automatic)
*Blaw-Knox Co.
*Erie Steel Construction Co.
*Fuller Co.
Howe Scale Mfg. Co.
*Jaeger Machine Co
Merrick Scale Mfg. Co.
Schaffer Poidometer Co.

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Stulz-Sickles Co.

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Stulz-Sickles Co.

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Smith Co., S. Morgan
Stulz-Sickles Co.

Welding Supplies
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*General Electric Co.
*Harnischfeger Corp.
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Well Drills (See Drills—Well)

*See also information in the 1937 Pit and Quarry HANDBOOK.

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PUT them up to Smith. Benefit by our ability to weld either to your designs and specifications or to those we'll prepare!

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BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Wheels (Car)
American Manganese Steel Co.
*Eagle Iron Works
Iowa Mfg. Co.

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Winches and Capstans
*Chain Belt Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Winches (Motor Truck)
Gar Wood Industries, Inc.

Wire and Cable (Electric)
*General Electric Co.
*Roebling's Sons Co., John A.

Wire Cloth
Cleveland Wire Cloth & Mfg. Co.
Ludlow-Saylor Wire Co.
National Wire Cloth Co.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Tyler Co., W. S.

Wire Rope
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of the American Chain & Cable Co., Inc.
*Leschen & Sons Rope Co., A.
*Roebling's Sons Co., John A.
Union Wire Rope Co.
Williamsport Wire Rope Co.

Wire Rope Fittings
Broderick & Bascom Rope Co.
*Leschen & Sons Wire Rope Co., A.
Page Engr. Co.
*Roebling's Sons Co., John A.
Union Wire Rope Co.
Williamsport Wire Rope Co.

Wire Rope Slings
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of the American Chain & Cable Co., Inc.
*Leschen & Sons Rope Co., A.
*Roebling's Sons Co., John A.
Union Wire Rope Co.
Williamsport Wire Rope Co.

Wire (Welding)
American Manganese Steel Co.
*Roebling's Sons Co., John A.

Worm Gears (See Gears and Pinions)

*See also information in the 1937 Pit and Quarry HANDBOOK.

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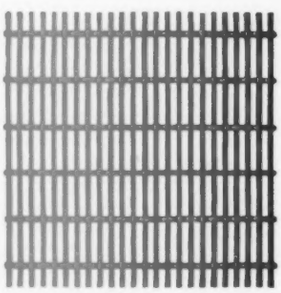

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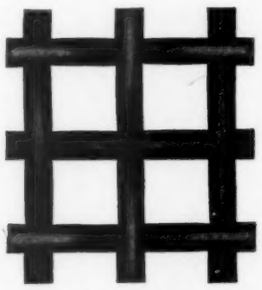
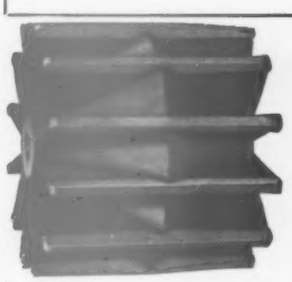


2 Mesh .162 Ga.

THE CLEVELAND WIRE CLOTH & MFG. COMPANY
574 E. 78th St. CLEVELAND, OHIO



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Material conveyed cannot lodge between belt and pulley to cut your belts.

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SLACKLINE EXCAVATORS — for digging gravel from rivers or wet pits. Cut costs by moving excavated materials direct to top of screening plant.

CRESCENT DRAG SCRAPERS — for bank mining, stripping, storing and reclaiming surplus products. The world's greatest excavator-conveyor.

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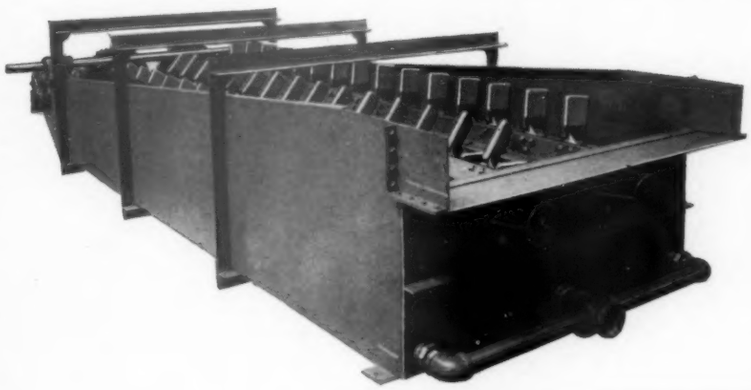
RUGGEDNESS, dependability, efficiency and ability to handle large production at lowest cost.



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These paddle type machines subject the material to the same washing action which has proved so successful in our screw type.

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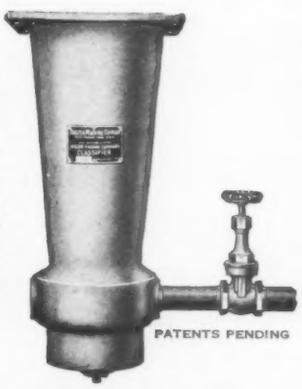
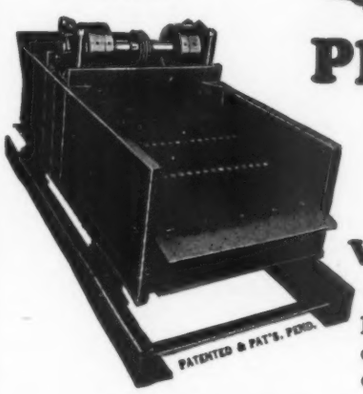
For sizing minus 5/16" gravel and sand, and for cleaning it by washing out silt and other light impurities.

Descriptive Bulletin No. 23





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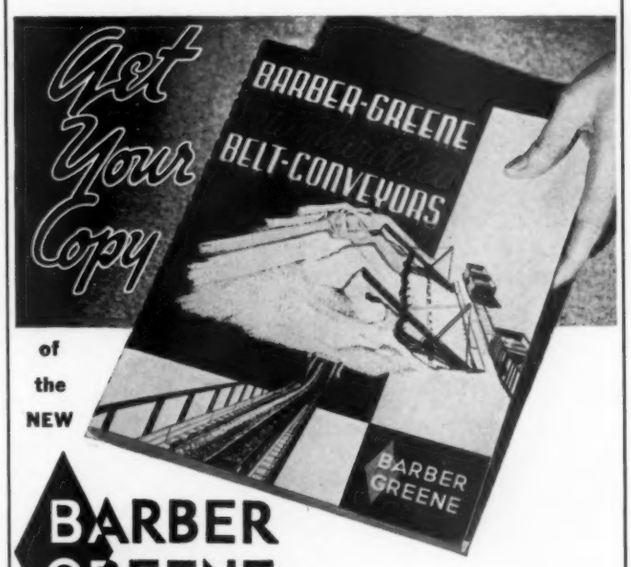

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MAIL TODAY— 37-17

Barber-Greene Company, Aurora, Illinois—Gentlemen: Send me without cost or obligation your new 116-page Belt Conveyor Catalog and Manual that not only shows the complete line of B-G *Standardized* Belt Conveyors, but has 20 pages devoted entirely to Engineering Data.

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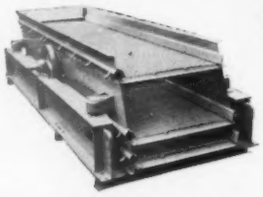

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In all Meshes and Metals

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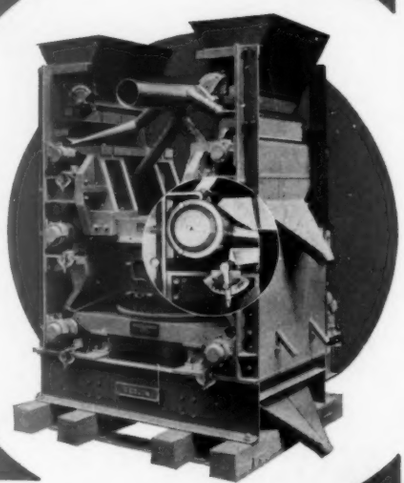

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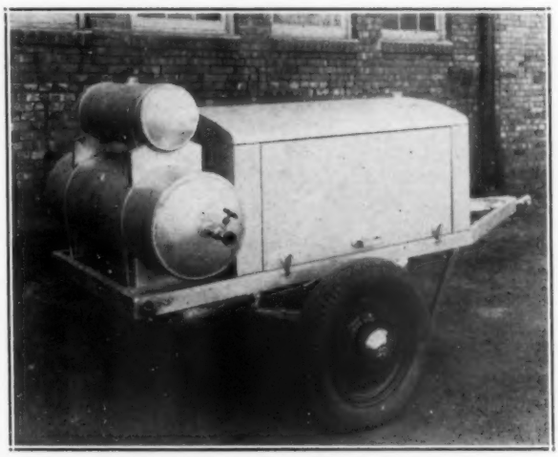

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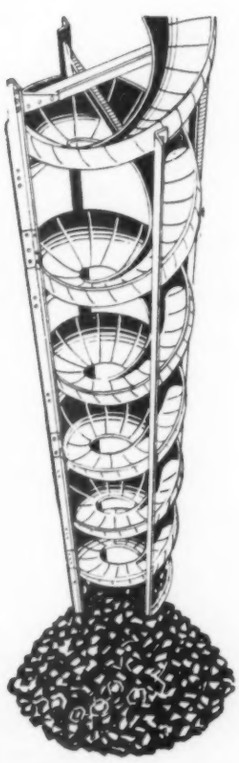

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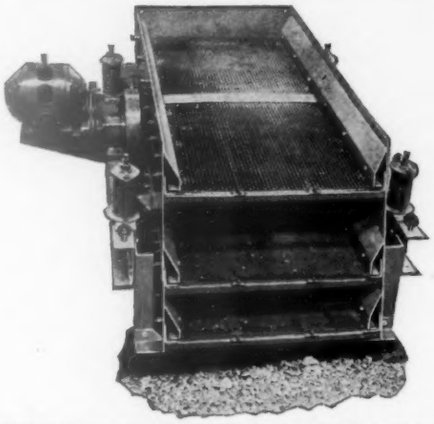

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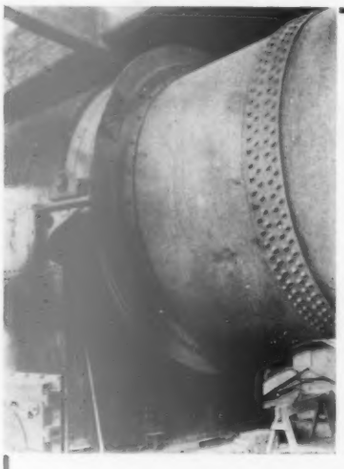

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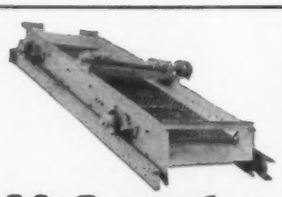

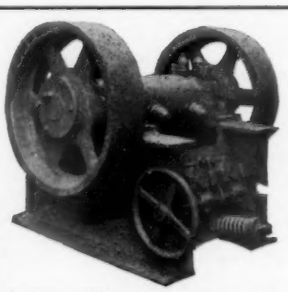

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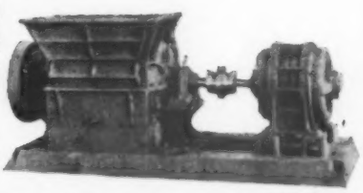

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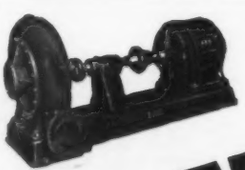

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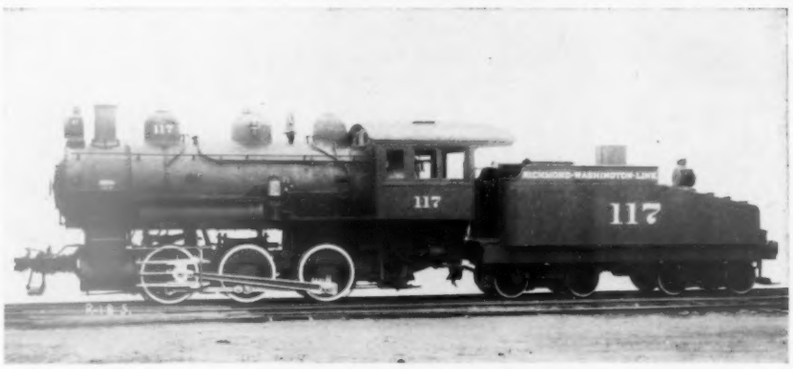

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50 Ton Davenport six wheel switching locomotive with separate tender, 17 x 24" cylinders.

35 Ton Baldwin four wheel switching locomotive with separate tender, 15 x 24" cylinders.

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Crushing Rolls—16"x10" up to 54"x24"—Gyratory Crushers
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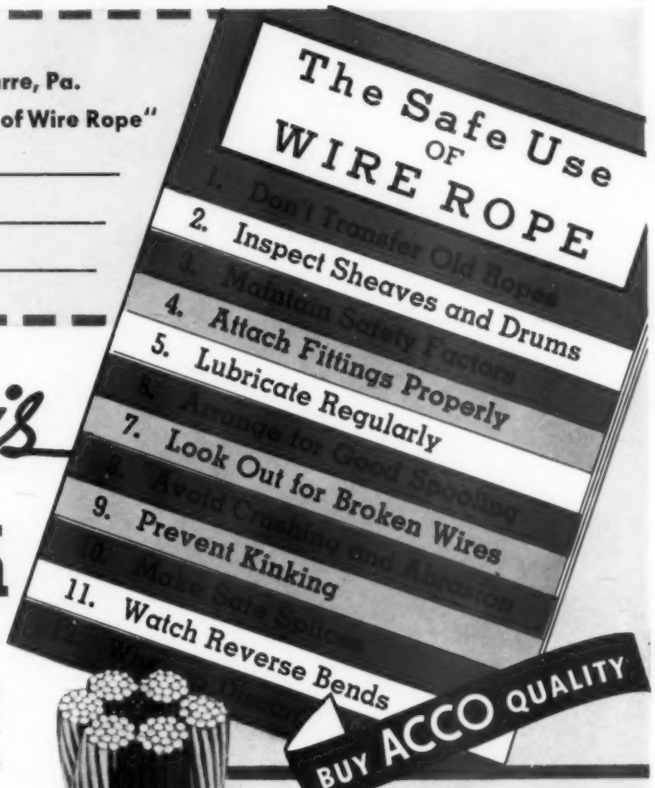
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